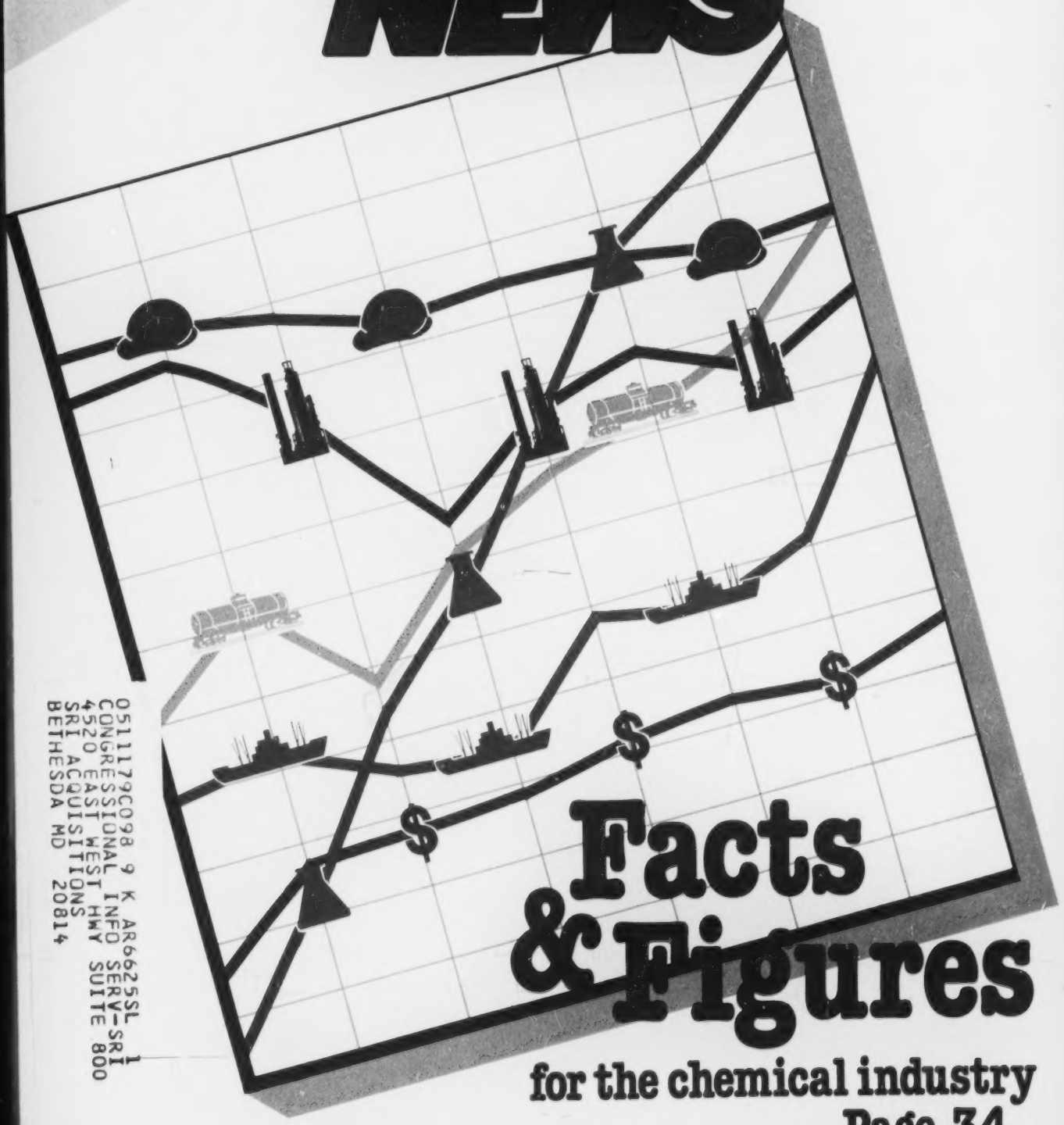
6/22/83 A1250-1

JUNE 20, 1988

CHEMICAL & ENGINEERING

Scientific news from the chemical congress in Toronto

NEWS



Facts & Figures

for the chemical industry

Page 34

0511179C098 9 K AR6625SL 1
CONGRESSIONAL INFO SERV-SRI
4520 EAST WEST HWY SUITE 800
SRI ACQUISITIONS
BETHESDA MD 20814

CHEMICAL & ENGINEERING
NEWS

Volume 66, Number 25
CENEAR 66 (25) 1–96
ISSN 0009-2347

JUNE 20, 1988

News of the Week

■ **In more than 3000 papers presented at AIDS conference in Stockholm last week, new findings were reported, but no breakthrough was announced.** **Page 4**

■ **New initiatives to address chemical safety problems and negative perceptions of chemical industry were announced at recent CMA annual meeting.** **Page 5**

■ **Last week's public hearing on NIH's intramural research program focused on the difficulties in recruiting and retaining high-quality research personnel.** **Page 5**

■ **NIH researchers seek approval to conduct a medical experiment that would introduce genetically engineered cells into human beings.** **Page 6**

■ **Signing of U.S.-Soviet agreement for cooperation in basic scientific research at Moscow summit was prevented by objections from U.S. agencies.** **Page 6**

Letters 2

Concentrates
Business 7
Government 12
Science/Technology 20

The Departments
Meeting Briefs 32
Newscripts 96

Business

Grace Specialty Chemicals, a cornerstone of W. R. Grace & Co., stresses service as ingredient for success. **Page 9**

Government

Industries pressured by July 1 deadline for filing toxic release data required by right-to-know act; foreign competitiveness aired in Senate hearings; extensive environmental agenda being compiled for next President and his Administration. **Page 13**

Science

From the Toronto meeting: studies of enzyme activity in nonaqueous media lead to better understanding of enzyme function; research on gas-phase clusters provides insight into atmospheric chemistry. **Page 21**

Technology

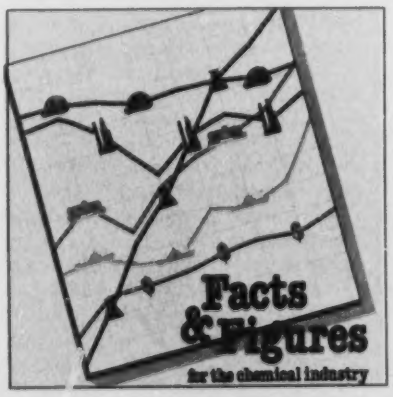
More from Toronto meeting: structure of zeolite beta determined using combination of direct measurements and computer modeling; catalytic technique developed for coprocessing of coal, petroleum; functionalizing carbon molecular sieves with catalytic species. **Page 23**

Education

The Toronto meeting continued: three innovative Canadian chemistry professors aid public understanding of chemistry. **Page 29**

ACS News

Chemical Congress in Toronto offered participants a variety of activities, captured on film by C&EN's roving photographer. **Page 83**



Facts & Figures

Production of chemicals continued to expand last year, and the U.S. chemical industry had what was probably its best year of the past decade in terms of sales and profitability. C&EN's annual statistical wrapup presents data on the industry's performance in the U.S. and abroad. **Page 34**

Chemical & Engineering News
1155—16th St., N.W., Washington, D.C. 20036
Editor: Michael Heylin
Assistant Managing Editors: David M. Kiefer, James H. Krieger, Janice R. Long, Donald J. Soisson, William J. Storck. **News Editor:** Wilbert C. Lepkowski
Staff Editor: Ernest L. Carpenter
Senior Editors: New York: Earl V. Anderson, Stephen C. Stinson; Chicago: Joseph Haggin; Washington: Doron Dagani, Lois R. Ember, Rebecca L. Rawls, Pamela S. Zurer
Associate Editors: Stuart A. Borman, Mairin B. Brennan, Bette Hileman, Richard J. Seltzer
Service Departments Editor: Dolores Miner
Editing Services: Anne Riesberg (Head), Arlene Goldberg-Gist (Editorial Assistant), Patricia Oates (Administrative Assistant)
News Bureaus: New York: (212) 697-3223 Marc S. Reisch (Assistant Editor), Rachel Eskenazi (Administrative Assistant). Chicago: (312) 256-4143 Ward Worthy (Head). Houston: (713) 973-8161 Bruce F. Greek (Head). Washington: (202) 872-4495 David J. Hanson (Head). West Coast: (415) 653-3630 Rudy M. Baum (Head). **Foreign Bureau:** London: (01) 540-0414 Dermot A. O'Sullivan (Head), Patricia L. Layman (Associate Editor)
Graphics and Production: Leroy Corcoran (Manager). Alan Kahan (Art Director). Barbara Fryer (Production/Art Director). Linda Mattingly (Staff Artist). Diane Kelly (Costing). **Business Manager:** Arthur Poulos
Circulation Development: Cynthia G. Smith

ADVISORY BOARD: William J. Bailey, Jacqueline K. Barton, Ernest H. Drew, Harry G. Drickamer, A. Nicholas Filippello, Myron Foveaux, Vincent L. Gregory Jr., Adam Heller, John D. Holmfeld, Isabella Karle, Koji Nakanishi, Richard Nicholson, Howard A. Schneiderman, Ellen K. Silbergeld, Howard E. Simmons, Robert M. Simon, William P. Slichter

Published by
AMERICAN CHEMICAL SOCIETY
(202) 872-4600; TDD (202) 872-8733
John K Crum, Executive Director

PUBLISHING BOARD: Ned D. Heindel (*Chairman*); *Board of Directors Chairman:* Ernest L. Eliel; *President:* Gordon L. Nelson; John H. Nelson; Louis D. Quin; Jean'ne M. Shreeve; and Barbara G. Wood

© Copyright 1988, American Chemical Society

Subscription & Member Record Service: Send all new and renewal subscriptions with payments to: Controller, ACS, P.O. Box 28597, Central Station, Washington, D.C. 20005. Correspondence and telephone calls for changes of address, claims for missing issues, subscription service, status of records and accounts should be directed to: Manager, Membership & Subscription Services, ACS, P.O. Box 3337, Columbus, Ohio 43210; (614) 421-3776.

For changes of address, include both old and new addresses with ZIP code numbers and mailing label from a recent issue. Allow four weeks for change to become effective. Claims for missing numbers will not be allowed if loss was due to failure of notice of change of address to be received in the time specified; if claim is dated (a) North America: more than 90 days beyond issue date, (b) all other foreign; more than one year beyond issue date; or if the reason given is "missing from files."

Subscription Rates 1988. Printed editions: nonmembers U.S. 1 yr. $49, 2 yr. $83, outside U.S. 1 yr. $75, 2 yr. $135. Air freight rates available on request. Rates above do not apply to nonmember subscribers in Japan, who must enter subscription orders with Maruzen Co. Ltd., 3-10 Nihonbashi 2-chome, Chuo-ku, Tokyo 103, Japan. Tel: (03) 272-7211. Single copies: Current $7.00. Rates for back issues and volumes are available from Microforms & Back Issues Office, ACS, 1155—16th St., N.W., Washington, D.C. 20036. Back and current issues available on microfilm and microfiche. Rates on request from Microform Program, ACS.

Chemical & Engineering News (ISSN 0009-2347) is published weekly except for the last week in December by the American Chemical Society at 1155—16th St., N.W., Washington, D.C. 20036. Second-class postage paid at Washington, D.C., and additional mailing offices. POSTMASTER: Send address changes to Chemical & Engineering News, Membership & Subscription Services, P.O. Box 3337, Columbus, Ohio 43210. ACS assumes no responsibility for the statements and opinions advanced by the contributors to its publications.

Advertising Management
CENTCOM LTD.
(For list of offices see page 95)

LETTERS

CHEMICAL SAFETY

Barium acetate pyrolysis

SIR: Concerning the explosion reported by Niles Fleischer (C&EN, April 11, page 4), I would like to point out that the pyrolysis of barium acetate gives acetone in high yield. Furthermore, on the basis of unpublished experiments I performed many years ago, I would surmise the decomposition of the acetate is being catalyzed by the added metallic oxides.

Jose Castrillon
Head, Department of Chemistry
Pan American University

Environment and technoiogy

SIR: As a scientist who has worked with environmental groups, I dispute Fred Tausch Jr. (C&EN, April 18, page 2) who depicts a negative sum game between environmentalism (based on disparaged social science) and technology (based on physical science). Nothing could be further from the truth.

Absent the "softer" sciences, there would be no defined property rights or market exchanges—without which there would be little of the innovation in manufacturing and services that mark the real and growing differences between free market economies and those that are centrally controlled. (Nor would we enjoy the right to comment on such matters in letters to editors.) A more thoughtful inspection of law and economics offers the effective solutions sought by both Tausch and his erstwhile tormentors.

Many efforts to improve environmental outcomes have relied upon rigid, central mandates—minimum standards, best available control technologies, and fixed timetables. User fees, tradable entitlements, and other market-oriented approaches have been ignored even though nearly all technologists and economists support them. Yet environmental dilemmas are characterized by ill- or undefined property rights to resources or to institutional barriers to the exchange of such rights. Why have we ignored market solutions?

Some reasons: Market-directed environmental incentives are opposed by those whose interests are aligned with the status quo; these include polluters and bureaucrats as well as some environmental enthusiasts. (If your lawyers are experienced with the present, hopelessly inefficient approach, it is risky to adopt a new system, especially if the present regimen appears to lend you a comparative advantage.) Many decision makers don't understand or don't believe microeconomic theory. And, as public choice economists conclude, free market institutions reduce the power of bureaucrats and legislators to grant favors to friends or buy votes, thereby devaluing their political capital.

Tausch suggests that all environmental groups are hostile to technology, that they seek a regimen of "selective draconian enforcement" and that they ignore or even welcome the "extortion, fraud, incompetence, and corruption" that necessarily follow. The environmental groups I know best would confound him. These include the Environmental Defense Fund (EDF), the Foundation for Research on Economics & the Environment, and the Political Economy Research Center, based in New York, Dallas, and Bozeman, Mont., respectively.

Ironically, people like Tausch are superb environmental fund raisers if they attain high office; Interior Secretary James Watt was a good example. Efforts to play positive sum games in ameliorating environmental problems are not as newsworthy—or as easily funded—as actions that engender vituperative attacks on industry or environmental groups. How exciting is it when the Nature Conservancy uncovers tax incentives to purchase wildlife habitat or EDF shows how farmers and cities might trade conserved irrigation water?

As for litigation, most C&EN readers don't know that environmentalists spent many years and million of dollars intervening to implement time-of-day power rates. Working with (yes, with!) the chemical industry's Petrochemical Energy Groups, EDF put a stop to uneconomic synthetic gas plants a decade ago. Such steps didn't just benefit the environment, they saved tens of billions of energy consumers' dollars (including industrial users') and improved the finances of dozens of gas and electric utilities. Yet these and other actions that predicated environmental reforms on sound economics have received no publicity because they lacked conflict and rancor or because the real villain turned out to be outdated government regulation.

To identify such positive sum environmental games, we must understand how institutional arrangements govern incentives. C&EN covers this territory and, with little added effort, it could play a role in uncovering opportunities. Better yet, imagine their joint credibility

Facts &

for the chemical industry

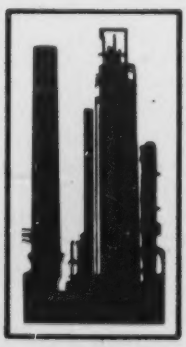
Chemical production increased in the U.S. last year, marking the fifth straight year of growth for the industry. Practically all major segments of the industry benefited from increased demand, although it was plastics that, as usual, set the pace. And as a consequence, many producers of plastics and of the feedstocks used to make them were running their plants at or near capacity.

With customers clamoring for more products, chemical companies basked, too, in the unusual ability to raise selling prices as well as output. Sales volume climbed, but profits surged even higher. All in all, 1987 was an untypically pleasant year to be in the chemical business.

Evidence of this radiates from the tables and graphs spread across the following pages of C&EN's annual Facts & Figures issue. Here are presented the statistical details that provide a measure of the chemical industry's performance during the past few years, both in the U.S. and to a lesser extent elsewhere among the world's other leading chemical-producing nations. The data come from a diverse array of sources, including government agencies, trade associations, international organizations, and the companies themselves that make up the industry. In many cases, these data have been treated analytically to add perspective to the trends taking place recently in the complex chemical industry.

at a glance

1. Production



The U.S. chemical industry raised its output last year nearly 6% overall. Plastics kept their typical hold on the head of the growth ranking, and in doing so bolstered the production of the many organic chemicals from which they are concocted. But organic intermediates also got a boost from strong growth for synthetic fibers. Meanwhile, a recovery for fertilizers led to higher production for several big-volume inorganic chemicals, such as sulfuric, nitric, and phosphoric acids. **Page 37**

2. Finances

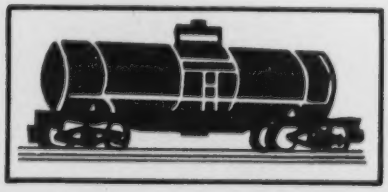
Income statements issued by the chemical industry at the end of 1987 haven't looked better in several years. The favorable combination of increased plant output and higher selling prices shoved sales upward and, coupled with the cost-cutting programs of previous years, gave a stout boost to companies' profitability. For a sampling of 30 major chemical companies, profit margins had not been so high in more than a decade. With demand strong, the industry has been cautiously raising its capital spending budgets, both at home and abroad, and plowing more money into R&D. **Page 45**

Figures

3. Employment

After declining for more than two years, employment in the chemical industry was on the increase during the second half of 1987. For the year as a whole, however, the number of workers in the industry averaged less than 1% more than during the previous year—and remains well below the level of the early 1980s. Because production was up, however, labor productivity improved further, although as wage rates increased unit labor costs were little changed from 1986. **Page 63**

4. Markets

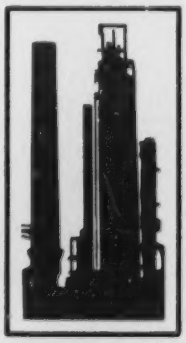


The further expansion of the overall U.S. economy and of consumer spending has stimulated a steadily rising demand for chemical products during the past five years. Two major markets that were less buoyant last year were home construction and auto production. But customers in such diverse industries as textiles, paper, home appliances, furniture, and plastics products more than made up the slack. **Page 66**

5. Foreign Trade

The U.S. balance of foreign trade in chemicals improved significantly last year as exports rose 16% but imports climbed only about half as much. Weakness of the dollar is largely responsible, as chemicals produced in the U.S. became less expensive in foreign markets but chemicals manufactured overseas were put at a price disadvantage in the U.S. **Page 68**

6. Foreign Chemical Industries



The favorable business climate enjoyed by U.S. chemical producers was matched in major chemical-producing nations elsewhere. In Europe, chemical output was moderately higher, but most large chemical companies were the beneficiaries of overall prosperity. Japanese chemical firms likewise benefited from strong domestic sales and made a good recovery in profitability from the relatively weak previous year. Sales and profits also improved in Canada. **Page 73**

Expansion persists through five years

Production by the U.S. chemical industry continued to grow moderately in 1987, rising 6% over 1986. That's the best year-to-year growth since 1983 and 1984, when the industry was recovering from the recession of the early 1980s. The increase for chemicals was slightly better than that for industry as a whole, which was up only 4%.

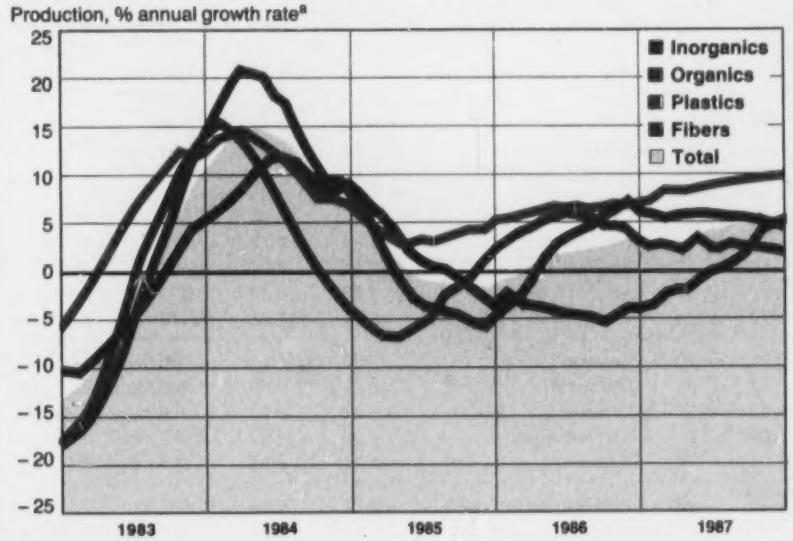
Industrial gases, organic chemicals, plastics materials, and agricultural chemicals experienced some of the largest gains. Plastics materials output was up a whopping 15%, the fifth high in five years. Overall production of thermoplastic resins was up 10%, led by a 43% increase for styrene-acrylonitrile, a relatively small-volume plastic, and a 19% rise for polyester.

Fertilizer production reversed the decline observed in 1985 and 1986. Output rose in all major categories, reflecting an increase in farm income. Paint and coatings production reached the highest level since 1978, and total output of synthetic fibers was also up. Cellulosic and acrylic fibers were the only categories of man-made fibers that declined in 1987, although polyester output remained well below the level of the early 1980s.

Basic chemicals recovered slightly, with output rising 6%, putting it back to the level it was six years earlier. Production of industrial gases, which was up 17%, paced the increase. Even minerals that had posted losses during the past decade were up.

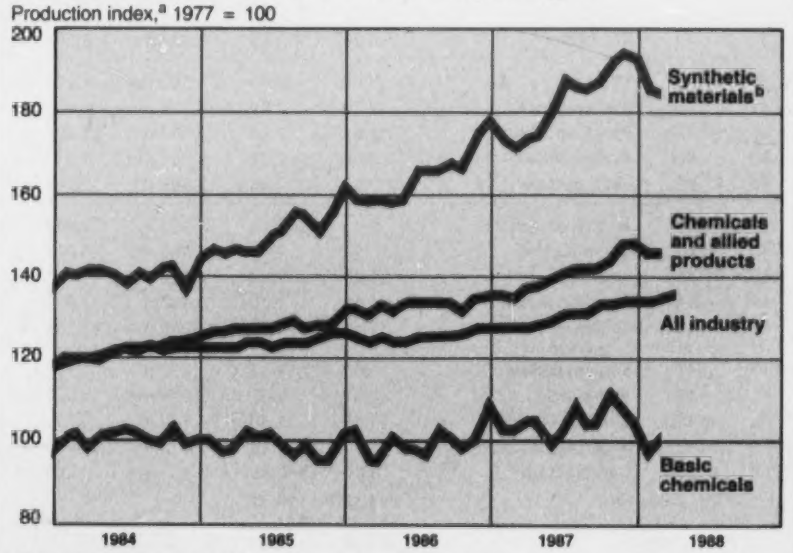
Performance of the chemically related products sector was only slightly better than it was in 1986. Soaps and toiletries output rose just 3%, unlike previous years in the past decade when this category showed annual increases averaging 7%. Drugs and medicines also rose 3%, the same as the average annual increase over the past decade.

Plastics set pace for steady chemical growth in 1987



a Average running annual growth rates in production of major plastics, inorganic and organic chemicals, and all chemicals, and in shipments of man-made fibers. **Sources:** International Trade Commission, Bureau of the Census, Society of the Plastics Industry, Textile Economics Bureau

Synthetic materials lead chemical output higher



a Seasonally adjusted. b Includes plastics, synthetic rubber, and man-made fibers.
Source: Federal Reserve Board

TOP 50 CHEMICALS: 1987 witnessed higher output for all but a handful

Rank 1987	Rank 1986[a]		Billions of lb 1987	Billions of lb 1986	Common units[b] 1987	Common units[b] 1986	Average annual growth 1986–87	1985–86	1982–87	1977–87
1	1	Sulfuric acid	77.49	73.64	38,748 tt	36,822 tt	5.2%	−7.1%	3.1%	1.1%
2	2	Nitrogen	47.32	48.62	653 bcf	671 bcf	−2.7	2.4	6.2	6.5
3	4	Ethylene	34.99	32.81	34,992 mp	32,81[illegible] mp	6.6	9.9	7.4	4.5
4	6	Ammonia	32.32	28.01	16,161 tt	14,005 tt	15.4	−19.1	0.5	−0.3
5	3	Oxygen	32.28	33.03	390 bcf	399 bcf	−2.3	1.5	2.2	0.2
6	5	Lime[c]	30.36	29.67	15,182 tt	14,834 tt	2.3	−6.1	1.5	−2.2
7	7	Sodium hydroxide	23.03	21.38	11,517 tt	10,691 tt	7.7	−1.[illegible]	4.2	0.9
8	8	Chlorine	21.93	20.87	10,963 tt	10,436 tt	5.0	0.4	3.6	0.5
9	9	Phosphoric acid	20.95	18.41	10,473 tt	9,206 tt	13.8	−12.5	4.9	2.8
10	10	Propylene	18.53	17.34	18,527 mp	17,343 mp	6.8	16.5	8.1	6.3
11	11	Sodium carbonate[d]	17.78	16.88	8,891 tt	8,438 tt	5.4	−1.8	2.6	5.5
12	14	Urea[e]	14.86	12.06	7,431 tt	6,029 tt	23.3	−9.7	2.8	6.6
13	13	Nitric acid	14.20	13.12	7,102 tt	6,562 tt	8.2	−10.9	−0.8	−0.9
14	12	Ethylene dichl ride	13.81	14.53	13,805 mp	14,529 mp	−5.0	20.1	12.6	5.6
15	15	Ammonium nitrate[f]	12.83	11.11	6,416 tt	5,556 tt	15.5	−18.0	−2.0	−1.1
16	16	Benzene	11.67	10.23	1,585 mg	1,389 mg	14.1	8.9	8.5	1.1
17	17	Carbon dioxide[g]	9.84	9.77	4,922 tt	4,883 tt	0.8	−2.3	5.2	9.6
18	18	Ethylbenzene	9.41	8.92	9,409 mp	8,915 mp	5.5	20.7	7.2	5.0
19	19	Vinyl chloride	8.23	8.42	8,230 mp	8,415 mp	−2.2	−11.1	10.9	3.8
20	21	Terephthalic acid[h]	8.11	7.68	8,110 mp	7,684 mp	5.5	18.4	10.9	1.2
21	20	Styrene	8.09	7.84	8,090 mp	7,838 mp	3.2	2.8	6.4	2.5
22	22	Methanol	7.29	7.33	7,292 mp	7,327 mp	−0.5	46.5	−0.7	1.6
23	25	Toluene[i]	6.73	5.82	928 mg	802 mg	15.7	14.7	5.4	−0.7
24	24	Formaldehyde[j]	6.08	5.89	6,077 mp	5,885 mp	3.3	5.0	4.8	1.1
25	26	Xylene	5.72	5.55	795 mg	771 mg	3.1	4.5	3.9	1.0
26	23	Ethylene oxide	5.62	5.94	5,623 mp	5,943 mp	−5.4	9.4	2.4	3.0
27	27	*p*-Xylene	5.15	5.00	5,152 mp	4,995 mp	3.1	4.5	9.9	5.9
28	28	Hydrochloric acid	4.99	4.83	2,495 tt	2,413 tt	3.4	−14.0	0.4	−0.2
29	29	Ethylene glycol	4.52	4.76	4,515 mp	4,759 mp	−5.1	13.9	0.9	3.1
30	30	Ammonium sulfate	4.37	4.17	2,183 tt	2,086 tt	4.7	−0.3	4.3	0.8
31	31	Cumene	4.15	3.70	4,151 mp	3,695 mp	12.3	10.5	8.6	4.3
32	41	Methyl *tert*-butyl ether[k]	3.37	2.24	3,372 mp	2,237 mp	50.7	18.3	32.6	nm
33	33	Phenol[l]	3.24	2.92	3,241 mp	2,921 mp	11.0	5.2	9.9	4.3
34	32	Acetic acid	3.23	2.93	3,227 mp	2,931 mp	10.1	1.2	3.3	2.7
35	35	Butadiene[m]	3.00	2.59	3,002 mp	2,593 mp	15.8	10.6	9.4	−1.5
35	34	Potash[n]	3.00	2.65	1,360 tmt	1,202 tmt	13.1	−7.3	−5.3	−4.6
37	35	Carbon black	2.72	2.59	2,724 mp	2,585 mp	5.4	0.5	3.4	−1.0
38	37	Propylene oxide	2.61	2.48	2,608 mp	2,480 mp	5.2	3.3	9.2	3.6
39	39	Acrylonitrile	2.55	2.31	2,551 mp	2,314 mp	10.2	−1.4	4.6	5.3
40	40	Vinyl acetate	2.51	2.25	2,505 mp	2,249 mp	11.4	6.5	6.0	5.4
41	38	Aluminum sulfate	2.45	2.44	1,223 tt	1,222 tt	0.1	−3.6	1.2	0.2
42	42	Cyclohexane	2.25	2.07	2,250 mp	2,071 mp	8.6	25.0	12.0	0.3
43	43	Acetone	2.08	1.94	2,082 mp	1,936 mp	7.5	8.3	4.2	1.1
44	44	Titanium dioxide	1.90	1.86	952 tt	931 tt	2.3	8.3	7.7	2.9
44	45	Sodium silicate	1.90	1.57	948 tt	786 tt	20.6	9.0	7.4	2.4
46	47	Sodium sulfate[o]	1.61	1.55	805 tt	775 tt	3.9	−6.3	−1.4	−4.2
47	48	Adipic acid	1.57	1.52	1,572 mp	1,522 mp	3.3	4.7	6.3	0.4
48	46	Calcium chloride[p]	1.55	1.56	773 tt	780 tt	−0.9	−2.6	−2.0	−4.3
49	49	Isopropyl alcohol	1.31	1.28	1,313 mp	1,275 mp	3.0	3.2	−1.0	−3.8
50	50	Caprolactam	1.16	0.85	1,161 mp	850 mp	36.6	−21.5	7.9	4.1
TOTAL ORGANICS			201.85	189.17			5.5%	9.3%	7.1%	2.7%
TOTAL INORGANICS			364.83	347.74			4.9%	−5.7%	2.3%	−0.1%
GRAND TOTAL			566.68	536.91			5.5%	−0.9%	4.8%	1.3%

a Revised. b tt = thousands of tons, bcf = billions of cubic feet, mp = millions of pounds, mg = millions of gallons, tmt = thousands of metric tons. c Except refractory dolomite. d Natural and synthetic. e 100% basis. f Original solution. g Liquid and solid only. h Includes both acid and ester without double counting. i All grades. j 37% by weight. k Production data for earlier years unavailable. l Synthetic only. m Rubber grade. n K_2O basis. o High and low purity. p Solid and liquid. nm = not meaningful.

PRODUCTION: Last year brought better-than-usual growth for basic chemicals and synthetics

Industrial production indexes, 1977 = 100	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
Total index	129.8	125.1	123.7	121.4	109.2	103.1	111.0	108.6	110.7	106.5	100.0	4%	3%
Manufacturing, total	134.7	129.1	126.4	123.4	110.2	102.2	110.5	108.2	111.5	107.1	100.0	4	3
Nondurable manufacturing	136.8	130.1	124.6	122.3	113.7	105.5	109.7	107.0	108.2	105.5	100.0	5	3
Chemicals and products	140.2	132.0	126.4	121.6	114.0	103.8	112.6	106.4	111.4	106.8	100.0	6	3
Chemicals and synthetic materials	135.6	123.8	118.6	114.7	109.1	95.4	109.4	99.4	113.7	108.2	100.0	10	3
Basic chemicals	104.9	98.9	100.0	100.6	95.0	90.6	104.3	107.2	110.1	110.7	100.0	6	0
Alkalies and chlorine	103.4	97.5	97.1	97.8	91.5	83.3	96.1	104.1	113.6	101.7	100.0	6	0
Industrial gases	150.3	128.3	127.0	123.6	114.0	103.9	115.4	105.0	107.2	98.7	100.0	17	4
Inorganic pigments	100.5	99.6	96.2	95.4	91.5	81.7	99.0	97.6	100.8	103.5	100.0	1	0
Inorganic chemicals, nec	98.2	94.1	96.5	97.9	92.9	90.9	104.6	109.4	111.1	115.3	100.0	4	0
Industrial organic chemicals	122.9	112.7	109.2	106.2	104.0	90.3	105.5	89.1	108.1	104.5	100.0	9	2
Synthetic materials	181.7	162.6	149.4	140.3	129.0	108.0	120.2	110.1	125.8	112.2	100.0	12	6
Plastics materials	252.5	220.0	197.4	179.8	158.7	129.9	136.1	122.1	132.6	115.6	100.0	15	10
Synthetic rubber	92.7	96.5	96.8	107.6	98.3	86.8	91.2	93.0	112.1	99.0	100.0	−4	−1
Man-made fibers	104.3	98.5	95.3	94.1	95.4	82.9	104.6	97.3	119.4	110.2	100.0	6	0
Chemical products	152.1	147.5	139.3	132.4	123.2	114.7	116.5	113.7	110.1	106.7	100.0	3	4
Drugs and medicines	138.3	134.8	126.4	121.7	118.8	114.2	112.0	112.9	107.5	105.1	100.0	3	3
Soap and toiletries	188.9	182.9	168.1	155.9	139.9	125.4	129.6	121.5	115.0	106.6	100.0	3	7
Paints	100.5	100.1	98.6	92.9	90.1	83.5	86.7	89.7	95.0	104.7	100.0	0	0
Agricultural chemicals	92.4	85.7	96.1	98.2	86.9	90.2	109.2	107.3	103.9	97.5	100.0	8	−1
Petroleum products	93.5	92.6	86.9	87.4	84.0	84.2	89.4	94.0	101.7	102.5	100.0	1	−1
Rubber and plastics products	163.6	151.4	146.1	143.5	124.3	110.2	116.4	107.8	114.9	107.5	100.0	8	5

nec = not elsewhere classified. **Source:** Federal Reserve Board

MINERALS: Mixed results in 1987 did little to alter long-term decline

Thousands of tons	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
Bromine, sold or used[a]	155[b]	155	160	193	185	200	189	189	249	223	217	0%	−3%
Calcium chloride, production[c,d]	773[b]	780	940	1,036	912	853	917	811	981	1,031	968	−1	−2
Iodine, consumption[e,f]	na	na	na	3.8	4.1	3.4	4.4	4.4	4.4	4.0	4.3	na	na
Imports[f]	1.3[b]	1.6	2.7	2.6	3.1	2.3	3.0	3.1	3.1	3.4	3.5	−19	−9
Lime, sold or used[g]	15,502	14,000	15,713	15,922	14,867	14,075	18,890	19,037	20,983	20,484	19,987	11	−3
Lithium, consumption[e,h]	3.0[b]	2.6	2.5	3.2	2.2	2.0	3.2	3.0	3.2	3.4	4.1	15	−3
Phosphate rock													
Marketable production	44,000	42,670	56,035	54,230	46,928	41,241	59,110	59,982	56,891	55,156	52,091	3	−2
Exports	9,000	8,651	10,071	12,707	13,239	10,849	11,458	15,737	15,827	14,187	14,584	4	−5
Potash (K_2O equivalent)[i]													
Production	1,500[b]	1,325	1,429	1,724	1,575	1,967	2,377	2,468	2,453	2,484	2,457	13	−5
Imports[j]	4,300[b]	4,643	5,063	5,323	4,894	4,253	5,287	5,481	5,693	5,189	5,076	−7	−2
Apparent consumption	5,390[b]	5,338	5,893	6,638	6,231	5,647	6,849	6,999	7,626	6,840	6,605	1	−2
Salt, total sold or used[k]	35,700[b]	36,663	40,067	39,225	34,573	37,894	38,915	40,396	45,820	42,896	43,439	−3	−2
Evaporated[l]	5,700[b]	6,233	6,010	5,492	5,532	5,305	6,209	6,358	6,248	5,872	5,704	−9	0
Rock[l]	12,100[b]	13,565	14,023	13,337	12,446	12,884	11,871	11,806	14,891	14,688	14,958	−11	−2
Salt in brine[l]	17,850[b]	16,865	20,034	20,397	16,595	19,705	20,835	22,231	24,681	22,336	22,777	6	−2
Sodium carbonate, production[d]	8,500	8,438	8,511	8,511	8,467	7,819	8,281	8,275	8,253	8,290	8,040	1	1
Sulfur, production[m]	11,617	12,221	12,797	11,742	10,240	10,788	13,388	13,080	13,339	12,318	11,824	−5	0
Apparent consumption[n]	12,481	11,669	13,192	13,976	12,112	11,088	14,093	15,056	15,145	13,889	12,850	7	0
Frasch, production	3,530	4,457	5,524	4,622	3,530	4,641	6,997	7,044	7,007	6,226	6,520	−21	−6
Recovered elemental, production	6,790	6,411	5,857	5,747	5,462	4,855	4,695	4,490	4,486	4,478	3,995	6	5
Other, production	1,296	1,354	1,416	1,372	1,249	1,293	1,695	1,547	1,845	1,615	1,310	−4	0

a Elemental bromine sold as such or used in preparation of bromine compounds by primary producers. b Preliminary figure. c 75% $CaCl_2$ equivalent. d Natural and synthetic. e Estimated apparent consumption. f Crude elemental iodine. g Includes Puerto Rican production. h Lithium content basis. i Includes muriate and sulfate of potash, potassium magnesium sulfate, and parent salts; excludes other chemical compounds containing potassium. j Includes nitrate of potash. k Total obtained by all recovery methods that was sold or used by domestic producers (figures differ slightly from U.S. production figures); figures for 1973–81 include Puerto Rican production. l Sold or used as such. m Sulfur content basis. n Calculated from shipments plus imports minus exports (sulfur content basis). na = not available. **Source:** Bureau of Mines

ORGANIC CHEMICALS: Production was strongly higher last year for many products

Millions of lb unless otherwise noted	Production											Annual change	
	1987[a]	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
Acetic acid, synthetic	3,227	2,728	2,897	2,619	2,807	2,748	2,705	2,977	3,265	2,776	2,570	18%	2%
Acetone	2,078	1,910	1,788	1,862	1,859	1,694	2,144	2,076	2,653	2,519	2,219	9	−1
Acrylonitrile	2,551	2,182	2,349	2,219	2,146	2,035	1,997	1,830	2,018	1,752	1,646	17	4
Aniline	923	824	716	786	663	557	634	659	690	606	584	12	5
Benzene, mg[b,c]	1,585	1,362	1,283	1,318	1,232	1,052	1,308	1,534	1,612	1,435	1,371	16	1
Bisphenol A	1,000	956	949	762	643	480	555	530	576	471	455	5	8
1,3-Butadiene[d]	3,002	2,546	2,340	2,452	2,353	1,915	2,986	2,799	3,583	3,515	3,259	18	−1
1-Butanol	935	881	716	908	833	730	809	790	766	756	660	6	4
Caprolactam	1,161	1,109	1,089	1,027	977	793	928	905[e]	945	919	867	5	3
Carbon tetrachloride	673	627	646	713	573	587	726	710	714	737	809	7	−2
Chloroform	462	422	275	405	362	299	405	273	356	349	302	9	4
Cumene	4,151	3,745	2,627	3,754	3,345	2,743	3,309	3,459	3,917	3,380	2,644	11	5
Cyclohexane	2,250	2,070	1,657	1,994	1,656	1,275	1,820	1,964	2,425	2,332	2,265	9	0
Dioctyl phthalate	350	296	275	301	300	266	304	353	336	409	400	18	−1
Dodecylbenzene[e]	na	851	547	561	545	509	535	563[f]	627	526	526	na	na
Ethanol, synthetic	na	529	649	1,060	1,077	1,023	1,317	1,451	1,408	1,267	1,339	na	na
Ethanolamines[g]	628	543	537	504	468	416	429	376	420	362	308	16	7
Ethylbenzene	9,332	9,020	7,386	7,562	7,876	6,656	7,813	7,642	8,448	8,385	8,312	3	1
Ethyl chloride	164	164	171	290	282	339	324	396	582	540	612	0	−12
Ethylene	34,992	32,859	29,847	31,383	28,680	24,501	29,418	28,667	29,904	25,955	25,172	6	3
Ethylene dichloride	13,806	12,940	12,101	10,710	11,506	7,619	9,974	11,108	11,794	11,001	10,997	7	2
Ethylene glycol	4,515	4,771	4,178	4,823	4,425	4,309	4,143	4,386	4,729	3,904	3,675	−5	2
Ethylene oxide	5,623	5,430	5,430	5,699	5,534	4,987	4,937	5,220	5,665	5,012	4,364	4	3
2-Ethylhexanol	638	571	536	541	387	325	389	367	318	420	493	12	3
Formaldehyde, 37%[h]	6,064	5,549	5,606	5,815	5,465	4,817	5,721	5,555	5,971	6,381	6,046	9	0
Isopropyl alcohol	1,313	1,301	1,235	1,394	1,209	1,380	1,669	1,836	1,900	1,730	1,888	1	−4
Maleic anhydride	387	359	394	359	299	260	293	304	323	341	294	8	3
Methanol, synthetic	7,292	7,205	5,003	8,186	7,982	7,555	8,577	7,153	7,367	6,443	6,453	1	1
Methyl chloride	455	605	410	482	409	366	405	362	463	454	476	25	0
Methyl ethyl ketone	na	600	537	543	531	468	614	692	716	644	635	na	na
Methyl methacrylate	1,029	943	858	917	844	721	592	564	633	570	478	9	8
Methylchloroform	694	652	869	675	586	595	611	587	656	661	512	6	3
Methylene chloride	516	566	467	607	584	532	891	780	931	na	745	−9	−4
Perchloroethylene	473	414	678	573	547	585	691	765	773	725	614	14	−3
Phenol, synthetic[i]	3,241	3,115	2,841	2,889	2,638	2,023	2,578	2,568	2,981	2,682	2,338	4	3
Phthalic anhydride	1,035	863	820	870	838	684	870	818	1,013	978	926	20	1
Propylene[j]	18,460	16,522	14,887	15,559	13,959	12,535	13,482	13,676	14,198	13,014	13,328	12	3
Propylene glycol	808	573	500	462	484	400	473	488	610	547	489	41	5
Styrene, monomer	8,015	7,888	7,622	7,709	6,802	5,942	6,679	6,856	7,484	7,186	6,867	2	2
Terephthalic acid, dimethyl ester[k]	8,110	6,257	6,490	5,912	5,626	4,843	6,235	6,054	6,159	5,954	5,410	30	4
Toluene, mg[b,l]	928	611	698	728	780	714	852	1,010	1,001	1,046	1,008	52	−1
Vinyl acetate	2,505	1,710	2,112	2,024	1,963	1,876	1,936	1,922	1,982	1,692	1,566	46	5
Vinyl chloride	8,230	8,439	9,463	6,084	6,875	4,902	6,874	6,466	6,389	6,941	5,986	−2	3
***o*-Xylene**	947	788	675	688	781	802	918	995	1,082	1,013	985	20	0
***p*-Xylene**	5,152	5,035	4,779	4,264	4,114	3,391	4,532	4,238	4,650	3,516	3,172	2	5

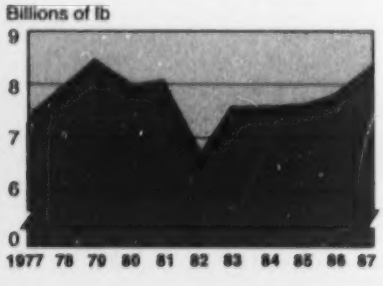
a Preliminary. b Tar distillers and coke-oven operators not included. c Specification grades. d Rubber grade. e Includes straight-chain dodecylbenzene, tridecylbenzene, and other straight-chain alkylbenzenes. f Preliminary figure, final figure not available. g Mono-, di-, and triethanolamines. h By weight. i Does not include data for coke ovens and gas-retort ovens. j All grades. k Includes both acid and dimethyl ester (DMT), without double counting. l High-purity toluene, includes material used in blending motor fuel. mg = millions of gallons. na = not available.
Source: International Trade Commission

INORGANICS: Despite 1987's growth, output of many products was below levels of late 1970s

Thousands of tons unless otherwise noted	Production											Annual change	
	1987[a]	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
Aluminum sulfate[b]	1,223	1,222	1,268	1,129	1,119	1,154	1,294	1,286	1,315	1,309	1,255	0%	0%
Ammonia,[c,d] 100%	16,161	14,474	17,319	16,692	14,072	15,801	19,044	19,653	18,634	17,119	17,756	12	−1
Ammonium nitrate,[e] 100%	6,416	6,089	6,776	7,146	6,240	7,091	8,861	9,128	8,293	7,210	7,177	5	−1
Ammonium sulfate,[d,f] 100%	2,183	2,080	2,093	2,067	1,956	1,768	2,185	2,136	2,363	2,449	2,264	5	0
Chlorine gas[g]	10,980	10,436	10,402	10,700	9,960	9,176	10,763	11,421	12,291	11,052	10,573	5	0
Hydrochloric acid,[h] 100%	2,495	2,413	2,807	2,732	2,468	2,450	2,574	2,888	3,090	2,793	2,668	3	−1
Hydrogen,[i,j] bcf, 100%	164	142	121	109	103	88	105	107	106	90	85	15	7
Nitric acid,[k] 100%	7,102	6,734	7,631	7,726	6,768	7,390	9,093	9,231	8,916	7,934	7,987	5	−1
Nitrogen gas,[i,l] bcf, 100%	653	617	665	661	560	483	490	479	427	379	328	6	7
Oxygen,[i,l] bcf, 100%	390	347	393	375	346	349	431	431	456	430	392	12	0
Phosphoric acid, 100% P_2O_5	10,473	9,578	10,518	11,370	9,767	8,253	9,958	10,848	10,318	9,637	8,745	9	2
Phosphorus[m]	343	364	359	386	366	361	426	432	460	441	430	−6	−2
Sodium chlorate, 100%	262	267	259	295	323	291	297	312	269	265	251	−2	0
Sodium hydroxide, 100%	11,518	10,691	10,811	10,914	10,039	9,385	10,621	11,625	12,759	11,309	11,000	8	0
Sodium phosphate[n]	565	617	625	675	669	651	696	727	757	739	717	−8	−2
Sodium silicate[o]	948	791	737	685	710	664	771	805	813	829	760	20	2
Sodium sulfate,[p] 100%	805	837	1,203	901	914	864	1,111	1,140	1,121	1,174	1,199	−4	−4
Sulfuric acid,[q] 100%	38,750	35,759	39,651	41,802	36,583	33,233	40,742	44,158	43,204	41,314	38,337	8	0
Titanium dioxide,[r] 100%	952	931	860	835	760	660	761	727	742	701	687	2	3
Urea	7,441	6,264	6,678	7,433	6,137	6,470	8,062	7,830	7,000	6,273	5,072	19	4

Note: bcf = billions of cubic feet. a Preliminary. b Commercial, 17% Al_2O_3; includes municipalities. c Synthetic anhydrous. d Excludes by-product ammonia liquor and ammonium sulfate. e Original solution. f Synthetic and noncoke by-product. g Includes quantities liquefied for use, storage, or shipment. h Includes anhydrous hydrochloric acid production. i High- and low-purity gas. j Liquid and gas; excludes amounts vented and used as fuel, and amounts produced in petroleum refineries for captive use. k Includes unspecified amounts of nitric acid produced but not withdrawn from the system. l Excludes amounts produced and consumed in making synthetic ammonia or ammonia derivatives. m Elemental, white (yellow), and red. n Tripolyphosphate (100% $Na_5P_3O_{10}$). o Soluble silicate glass (water glass), solid and liquid (anhydrous); excludes amounts produced and consumed in making meta-, ortho-, and sesquisilicates. p Anhydrous, high and low purity, and Glauber's salt. q Gross (new and fortified). r Composite and pure. **Sources:** Department of Commerce, International Trade Commission

Man-made noncellulosic fibers output

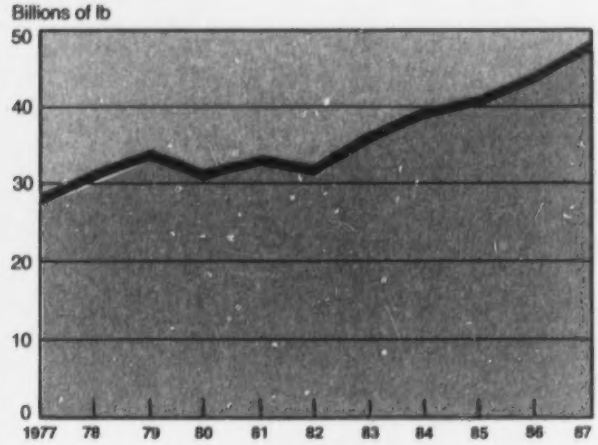


MAN-MADE FIBERS: For three big-volume materials, 1987 was robust

Millions of lb	Production											Annual change	
	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
NONCELLULOSIC FIBERS													
Acrylic[a]	592	616	631	671	671	624	691	779	761	726	709	−4%	−2%
Nylon[b]	2689	2514	2343	2412	2419	1927	2332	2358	2,720	2550	2326	7	1
Olefins[c]	1495	1393	1249	997	906	723	785	748	759	692	635	7	9
Polyester	3541	3305	3341	3392	3544	3169	4176	3989	4,178	3800	3642	7	0
CELLULOSIC FIBERS													
Acetate[d]	607	619	558	199	229	196	261	316	324	308	290	−2	8
Rayon				421	401	388	509	490	606	597	598		
GLASS FIBER	na	na	na	1394	1168	899	1041	867	1,014	923	787	na	na
TOTAL[e]	**8924**	**8447**	**8122**	**9486**	**9336**	**7926**	**9795**	**9547**	**10,362**	**9596**	**8987**	**6%**	**nc**

Note: Totals may not add because of rounding. a Includes modacrylic. b Excludes aramid in 1983–87. c Includes olefin yarn and monofilaments and olefin and vinyon staple, tow, and fiberfill. d Includes diacetate and triacetate; excludes production for cigarette filters. e Totals for 1985, 1986, and 1987 exclude glass fiber. na = not available. nc = not comparable. **Source:** Textile Economics Bureau

Plastics production



PLASTICS: Volume rose to record levels for major resins in 1987

Millions of lb[a]	Production											Annual change	
	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
THERMOSETTING RESINS													
Epoxy[b]	433	398	385	406	334	286	336	315	361	299	261	9%	5%
Polyester[c]	1,370	1,271	1,223	1,232	1,084	865	997	947	1,147	1,209	1,061	8	3
Urea	1,382	1,271	1,210	1,199	1,172	998	1,165	1,165	1,367	1,122	963	9	4
Melamine	212	173	192	210	180	158	179	167	200	202	200	23	1
Phenolic[d]	2,869[e]	2,735[e]	2,621[e]	2,502[e]	2,477[e]	2,006[e]	2,333[e]	1,499	1,781	1,617	1,458	5	nc
TOTAL	**6,266**	**5,848**	**5,631**	**5,549**	**5,247**	**4,313**	**5,010**	**4,093**	**4,856**	**4,449**	**3,943**	**7**	**nc**
THERMOPLASTIC RESINS													
Polyethylene													
Low density[f]	9,629	8,903	8,889	8,413	8,041	7,503	7,693	7,291	7,793	7,111	6,471	8	4
High density[g]	7,999	7,182	6,671	6,085	5,689	4,928	4,695	4,405	5,010	4,201	3,652	11	8
Polypropylene	6,647	5,812	5,139	4,940	4,433	3,477	3,955	3,648	3,841	3,074	2,747	14	9
Styrene-acrylonitrile	132	92	87	99	93	91	107	111	124	120	115	43	1
Polystyrene	4,782	4,470	4,054	3,838	3,570	3,191	3,621	3,521	4,005	3,823	3,446	7	3
Acrylonitrile-butadiene styrene and other styrene polymers[h]	2,398	2,196	2,036	2,127	1,889	1,380	1,745	1,705	2,107	2,012	1,882	9	2
Polyamide, nylon type	507	465	399	396	321	228	312	274	327	275	254	9	7
Polyvinyl chloride and copolymers	7,971	7,256	6,772	6,760	6,067	5,326	5,707	5,470	6,119	5,723	5,253	10	4
Thermoplastic polyester	1,394	1,175	965	899	778	648	609	na	na	na	na	19	na
Other vinyl resins[i]	212	195	190	187	186	177	208	196	220	197	197	9	1
TOTAL	**41,671**	**37,746**	**35,202**	**33,744**	**31,067**	**26,949**	**28,652**	**26,621**	**29,546**	**26,536**	**24,017**	**10%**	**6%**

Note: Totals are for those products listed and exclude some small-volume plastics. a Dry-weight basis unless otherwise specified. b Unmodified. c Unsaturated. d Includes other tar acid resins. e Gross-weight basis. f Density 0.940 and below. g Density above 0.940. h Includes styrene-butadiene copolymers and other styrene-based polymers. i Includes polyvinyl butyral, polyvinyl formal, and polyvinylidene-chloride. **na** = not available. **nc** = not comparable. **Source:** Society of the Plastics Industry

SYNTHETIC RUBBER: Output of all types rose last year

Thousands of metric tons	Production											Annual change	
	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
Styrene-butadiene rubber	850	792	735	958	904	876	1032	1074	1378	1395	1395	7%	−5%
Polybutadiene	371	336	330	359	333	288	342	311	397	378	361	10	0
Nitrile	69	59	53	67	55	45	66	63	75	73	70	17	0
Ethylene-propylene	254	230	215	215	175	123	178	144	175	174	158	10	5
Other[a]	638	596	505	556	468	498	404	423	509	453	432	7	4
TOTAL	**2182**	**2013**	**1838**	**2155**	**1935**	**1830**	**2022**	**2015**	**2534**	**2473**	**2416**	**8%**	**−1%**

a Includes butyl, polychloroprene, polyisoprene, silicone, and other synthetic elastomers. Some values are estimated. **Source:** Rubber Manufacturers Association

FERTILIZERS: Production rebounded a bit during 1987 crop year

Thousands of tons	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
NITROGEN (N)													
Domestic production	10,741	10,425	12,532	10,364	9,855	11,598	13,036	12,323	11,106	10,466	10,789	3%	0%
Imports	3,656	3,979	3,598	3,940	2,654	2,531	2,455	2,566	2,165	1,866	1,842	−8	7
Exports	2,708	2,068	3,227	2,080	2,074	2,499	3,088	2,641	2,468	1,778	1,251	31	8
Domestic supply	11,689	12,336	12,903	12,224	10,435	11,630	12,403	12,248	10,803	10,554	11,380	−5	0
PHOSPHATE (P_2O_5)													
Domestic production	9,903	8,581	10,666	9,611	8,043	7,818	10,471	10,012	9,432	8,245	7,793	15	2
Imports	118	111	141	121	133	193	250	239	236	229	245	6	−7
Exports	4,282	3,768	5,547	4,352	3,916	3,751	4,381	3,925	3,848	3,290	2,501	14	6
Domestic supply	5,739	4,924	5,260	5,380	4,260	4,260	6,340	6,326	5,820	5,184	5,537	17	0
POTASH (K_2O)													
Domestic production	1,311	1,052	1,413	1,653	1,859	1,831	2,262	2,474	2,519	2,176	2,584	25	−7
Imports	4,355	4,759	5,355	5,164	4,402	4,797	5,487	5,403	5,085	4,948	4,955	−8	−1
Exports	599	494	588	528	624	641	876	1,048	999	1,003	994	21	−5
Domestic supply	5,067	5,317	6,180	6,289	5,637	5,987	6,873	6,829	6,605	6,121	6,545	−5	−3

Note: Years ending June 30. **Source:** Department of Agriculture

NITROGEN: Output edged higher but remained well below recent peak

Thousands of tons (N)	Production 1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
Ammonia[a]	4,857	4,610	5,255	4,179	3587	5,032	5,348	5,270	4,603	4,063	4,307	5%	1%
Ammonium nitrate[b,c]	667	704	836	913	943	1,105	1,157	1,096	1,137	1,044	1,169	−5	−5
Ammonium sulfate[c]	478	482	484	517	395	432	502	521	509	497	547	−1	−1
Urea	1,687	1,624	1,999	1,786	1692	1,684	1,383	1,572	1,201	1,001	937	4	6
All other	3,052	3,005	3,958	2,969	3238	3,345	3,964	3,864	3,656	3,871	3,829	2	−2
TOTAL	**10,741**	**10,425**	**12,532**	**10,364**	**9855**	**11,598**	**12,354**	**12,323**	**11,106**	**10,476**	**10,789**	**3%**	**0%**

Note: Years ending June 30. a Includes aqueous solutions. b Includes ammonium nitrate-limestone mixtures. c Adjusted for estimated quantity going into nonfertilizer uses. **Source:** Department of Agriculture

PHOSPHATE: Production overall recovered part of ground lost in 1986

Thousands of tons (P_2O_5)	Production 1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
Ammonium phosphate[a]	5448	4984	6,525	6156	5026	4434	6,243	5,519	5082	4548	4118	9%	3%
Concentrated superphosphate	1091	1093	1,145	1172	1184	1151	1,694	1,737	1901	1768	1750	0	−5
Normal and enriched superphosphate	138	70	102	113	110	153	376	384	320	303	376	97	−10
All other	3226	2434	2,894	2170	1723	2080	2,613	2,372	2129	1626	1549	33	8
TOTAL	**9903**	**8581**	**10,666**	**9611**	**8043**	**7818**	**10,926**	**10,012**	**9432**	**8245**	**7793**	**15%**	**2%**

Note: Years ending June 30. a Liquid and solid, excluding that combined with potash salts in the process of manufacture. **Source:** Department of Agriculture

POTASH: Total production made big gain, but was still far under earlier levels

Thousands of tons (K_2O)	Production 1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
Potassium chloride	1035	762	1107	1248	1456	1383	2007	1874	2082	1770	2098	−36%	−7%
Potassium sulfate	241	255	271	370	368	413	481	565	402	371	451	−5	−6
All other	35	35	35	35	35	35	35	35	35	35	35	0	0
TOTAL	**1311**	**1052**	**1413**	**1653**	**1859**	**1831**	**2523**	**2474**	**2519**	**2176**	**2584**	**25%**	**−7%**

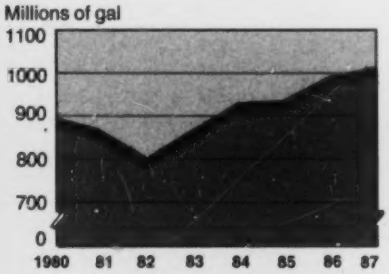
Note: Years ending June 30. **Source:** Department of Agriculture

PESTICIDES: Production of herbicides and insecticides fell in 1986, but fungicides rose

Millions of lb	Production											Annual change	
	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1976	1985–86	1976–86
Herbicides[a]	725	756	716	604	623	839	806	657	664	674	656	−4%	1%
Insecticides[b]	342	370	350	306	379	448	506	617	605	570	566	−8	−5
Fungicides	113	109	123	106	111	143	156	155	148	143	142	4	−2
TOTAL	1180	1235	1189	1017	1113	1430	1468	1429	1416	1388	1364	−4%	−1%

a Includes plant growth regulators. b Includes rodenticides, soil conditioners, and fumigants. **Source:** International Trade Commission

Paints and coatings shipments



COATINGS: Shipments edged up to highest level since 1978

Millions of gal	Shipments											Annual change	
	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
Architectural	510	501	477	457	433	374	417	439	472	na	na	2%	na
Product[a]	360	350	317	336	294	280	312	316	351	na	na	3	na
Special purpose	133	136	145	145	130	129	129	135	116	na	na	−2	na
TOTAL	1004	987	939	938	857	783	858	890	939	1033	844	2%	2%

a For original equipment manufacturers. **Source:** Department of Commerce

AEROSOLS: Total volume continued steady rise begun in 1983

Millions of units	Production											Annual change	
	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–87	1977–87
Personal products	964	952	879	832	747	628	645	637	772	729	720	1%	3%
Household products	640	635	630	603	586	556	575	580	653	628	600	1	1
Automotive and industrial products	379	375	342	337	303	286	302	310	300	275	230	1	5
Paints and finishes	307	297	290	307	300	295	313	310	302	309	331	3	−1
Insect sprays	190	193	190	184	180	166	173	150	199	132	120	−2	5
Food products	140	136	140	138	132	131	145	130	141	143	125	3	1
Animal products	22	22	15	16	19	19	14	15	18	15	18	0	2
Miscellaneous	80	18	23	15	15	13	28	30	14	a	5	344	32
TOTAL	2722	2628	2509	2432	2282	2094	2195	2162	2399	2231	2149	4%	2%

a Not shown separately. **Source:** Chemical Specialties Manufacturers Association

CHLOROFLUOROCARBONS: Poundage continued to recover from low point in 1982

Millions of lb	Production											Annual change	
	1987[a]	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	1986–37	1977–87
Chlorodifluoromethane (F-22)	284	271	235	254	236	174	252	227	211	206	179	5%	5%
Dichlorodifluoromethane (F-12)	368	322	302	337	290	258	325	295	294	327	358	14	0
Trichlorofluoromethane (F-11)	223	202	176	185	215	140	163	158	167	194	213	10	0
All other fluorinated hydrocarbons[b]	na	344	306	337	279	na	na	na	202	189	171	na	na
TOTAL	na	1139	1019	1113	1020	na	na	na	874	916	921	na	na

a Preliminary. b Includes other fluorohalogenated hydrocarbons. na = not available. **Source:** International Trade Commission

Chemical industry gets its act together

Chemical company executives probably have had their 1987 calendars bronzed and placed on shelves with other favored mementos, such as baby shoes and pictures of their children and grandchildren.

Last year proved to be one of the best years for the chemical industry in the past decade. Demand surged, prices increased mightily, and what was not sold in the U.S. could be shipped abroad, where it could compete with products from other countries because the dollar had weakened. And although imports of chemicals into the U.S. continued to increase, that increase was less than the improvement in export growth.

The result was that plant capacity utilization increased throughout the year, until by the end of 1987 many plants, especially those making ethylene and downstream plastics, were operating full out. As a result, plant efficiencies increased and profitability soared.

1987 finally saw the end of deflation in the chemical industry, as prices increased to the point that, by the end of the year, price growth was more than making up for the poor performance of the previous few years.

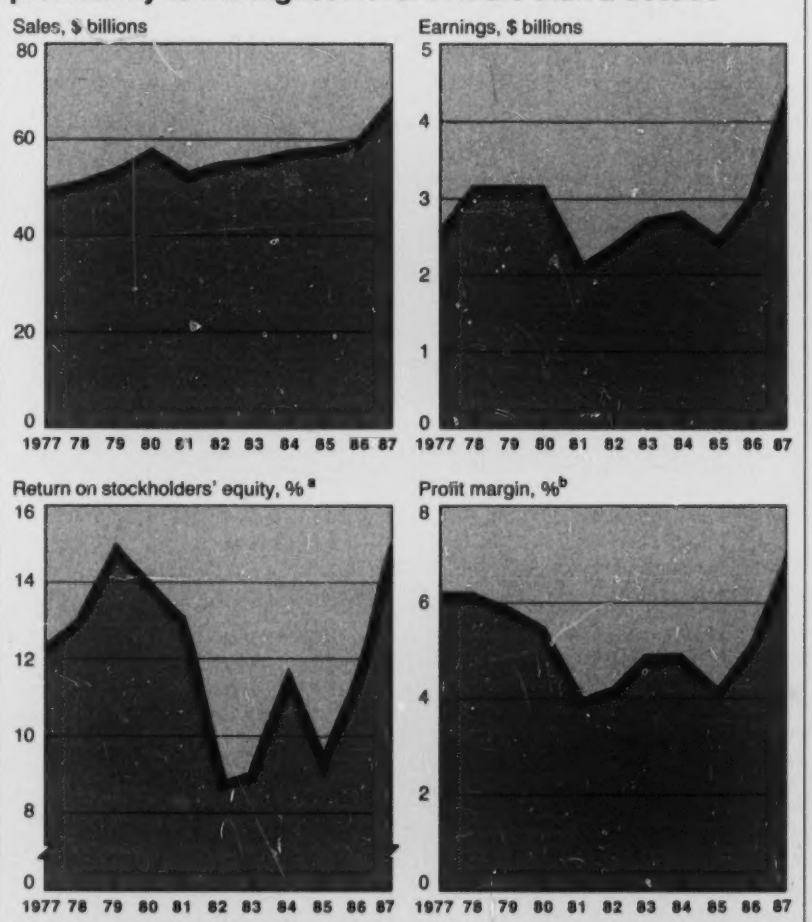
As a result, in 1987, sales for the U.S. chemical industry had the greatest year-to-year increase since the inflation-driven gains of the late 1970s. Only this time around, inflation was not general throughout the economy as it was in the late 1970s, when sales were increasing but physical volume was essentially flat. The increases for the chemical industry, therefore, were much more real. Sales for 30 chemical companies tracked by C&EN climbed an average 12% last year.

Earnings were even better. Earnings leverage brought on by a slimmed down work force and improved plant efficiencies, plus selling prices that were rising faster than raw material costs, served to push earnings up an average of about 50% for the industry.

Because of efficiencies brought about by increased plant utilization rates and the continued eye on such internal costs as employment, profitability for the chemical industry soared. Profit margins increased to about 6.7% from just 5.0% in 1986. And return on equity jumped to 15.2% from the year-earlier level of 11.7%.

Thus far, it looks as if the good times of 1987 are easily going to carry through 1988. Chemical prices are still rising faster than general inflation rates; capacity use is high enough that some firms are announcing plans for new plants; the chemical trade surplus is continuing to grow; and sales and earnings are off to a better start than last year.

A surge in earnings last year spurred chemical companies' profitability to the highest level in more than a decade



Note: Based on data for 30 major chemical companies. a After-tax earnings as a percentage of year-end stockholders' equity. b After-tax earnings as a percentage of sales.

TOP 100 CHEMICAL PRODUCERS: Mergers, broad industry restructuring resulted in considerable

Rank[a] 1987	1986		Chemical sales 1987 ($ millions)	Change from 1986	Chemical sales as % of total sales	Industry classification	Chemical operating profits[b] ($ millions)	Change from 1986	Chemical operating profits as % of total operating profits	Operating profit margin[c]	Identifiable chemical assets ($ millions)	Chemical assets as % of total assets	Operating return on chemical assets[d]
1	1	Du Pont	$13,051	10.2%	42.8%	Diversified	$2314	31.2%	57.7%	17.7%	$9265	36.9%	25.0%
2	2	Dow Chemical	10,847	22.4	81.1	Basic chemicals	1930	97.3	84.2	17.8	9379	65.3	20.6
3	3	Exxon	7,177	18.1	8.7	Petroleum	1087	33.0	14.2	15.1	6285	8.5	17.3
4	4	Union Carbide	6,177[e]	23.5	89.3	Basic chemicals	872	16.6	97.4	14.1	6219	78.8	14.0
5	5	Monsanto	5,163	9.8	67.6	Basic chemicals	766	−14.5	104.4	14.8	3995	47.3	19.2
6	29	Hoechst Celanese	4,284	221.9	93.2	Basic chemicals	na	na	na	na	na	na	na
7	6	BASF	3,816	14.3	88.0	Basic chemicals	na	na	na	na	na	na	na
8	7	Shell Oil	3,578	8.7	17.2	Petroleum	600	−7.4	29.8	16.8	3681	13.7	16.3
9	8	Amoco	3,494	19.3	15.6	Petroleum	704	50.7	25.4	20.1	2689	10.8	26.2
10	16	Occidental Petroleum	2,991	43.2	16.9	Petroleum	398	126.7	51.6	13.3	2471	14.8	16.1
11	12	Mobil	2,926	22.4	5.2	Petroleum	433	111.2	10.2	14.8	2316	5.6	18.7
12	10	Allied-Signal	2,795	−0.9	25.1	Diversified	306	−11.6	40.8	10.9	2043	20.0	15.0
13	11	W. R. Grace	2,794	12.1	61.9	Specialty chemicals	357	25.3	81.5	12.8	1960	43.8	18.2
14	15	General Electric	2,751[e]	18.0	6.8	Diversified	507	19.6	11.4	18.4	3891	10.0	13.0
15	13	Eastman Kodak	2,600	9.3	19.5	Photo equipment	388	70.9	18.4	14.9	2514	17.4	15.4
16	14	Chevron	2,593	9.0	9.2	Petroleum	397	170.1	12.0	15.3	1754	5.1	22.6
17	17	Rohm & Haas	2,203	6.6	100.0	Basic chemicals	323	15.4	100.0	14.7	1587	81.2	20.4
18	19	American Cyanamid	1,960	7.6	47.1	Basic chemicals	193	43.3	41.3	9.8	1387	33.6	13.9
19	—	Arco Chemical	1,952	26.7	100.0	Basic chemicals	398	63.1	100.0	20.4	1746	68.9	22.8
20	21	Bayer USA	1,951	9.3	46.5	Basic chemicals	84[f]	0.0	68.3	4.3	na	na	na
21	23	Phillips Petroleum	1,928	13.5	18.0	Petroleum	482	61.2	44.2	25.0	1165	9.6	41.4
22	20	Air Products[g]	1,919	6.8	89.2	Basic chemicals	373	2.8	116.7	19.4	2311	85.5	16.1
23	33	Quantum Chemical	1,875	72.6	73.1	Basic chemicals	348	180.5	91.5	18.5	1483	57.5	23.4
24	24	Borden	1,857	13.4	28.5	Dairy products	208	18.2	33.9	11.2	1121	27.0	18.6
25	27	B. F. Goodrich	1,741	19.4	80.3	Rubber products	210	57.3	92.1	12.1	1280	66.0	16.4
26	22	Hercules	1,686	−1.3	62.6	Basic chemicals	134	32.7	64.4	7.9	1318	37.7	10.2
27	26	Ashland Oil	1,643	11.2	22.9	Petroleum	90	26.8	33.6	5.5	603	14.9	14.9
28	25	Ciba-Geigy	1,620	8.7	57.4	Specialty chemicals	na	na	na	na	na	na	na
29	30	Texaco	1,587	24.1	4.6	Petroleum	129	41.8	1.9	8.1	1182	3.5	10.9
30	28	FMC	1,488	6.4	48.0	Machinery	242	8.0	69.6	16.3	1335	51.5	18.1
31	31	Ethyl	1,406	10.5	54.5	Basic chemicals	258	4.2	65.8	18.3	1018	51.4	25.3
32	18	Atlantic Richfield	1,379	33.9	8.2	Petroleum	na	na	na	na	na	na	na
33	34	Dow Corning	1,303	20.1	100.0	Specialty chemicals	135[f]	22.1	100.0	10.4	na	na	na
34	72	Rhône-Poulenc	1,300	242.1	100.0	Specialty chemicals	na	na	na	na	na	na	na
35	32	Olin	1,232	10.6	63.8	Basic chemicals	99	24.1	66.4	8.0	924	54.8	10.7
36	35	International Minerals[h]	1,214	12.7	74.1	Agrochemicals	104	197.4	58.8	8.5	1769	72.7	5.9
37	36	National Starch	1,208	13.6	100.0	Specialty chemicals	175	25.0	100.0	14.5	941	100.0	18.6
38	37	Unocal Corp.	1,071	1.4	11.4	Petroleum	27	−41.3	14.9	2.5	648	6.4	4.2
39	58	Huntsman Chemical	1,022	79.3	100.0	Basic chemicals	na	na	na	na	na	na	na
40	—	Akzo	992	26.9	100.0	Basic chemicals	42	26.3	100.0	4.3	na	na	na
41	41	Aluminum Co. of America	982[e]	16.9	12.6	Nonferrous metals	63	284.0	9.2	6.4	2444	24.7	2.6
42	40	PPG Industries	953	13.0	18.4	Glass products	140	35.9	18.0	14.7	1019	20.4	13.7
43	—	BP America	943	48.5	6.1	Petroleum	32	−38.5	1.4	3.4	na	na	na
44	39	Lubrizol	940	5.7	91.9	Specialty chemicals	140	−0.1	110.5	14.8	649	69.1	21.5
45	46	Aristech	919	22.4	100.0	Basic chemicals	120	23.1	100.0	13.1	na	na	na
46	74	Freeport-McMoRan	860	129.8	56.8	Agrochemicals	106	40.8	33.5	12.4	714	22.6	14.9
47	48	NL Industries	859	17.1	62.7	Petroleum services	209	23.5	140.7	24.4	734	56.3	28.5
48	42	Pennwalt	846	8.9	74.1	Basic chemicals	103	10.6	74.4	12.2	716	68.7	14.4
49	47	Nalco Chemical	842	14.4	100.0	Specialty chemicals	131	21.2	100.0	15.6	747	100.0	17.5
50	44	Reichhold Chemicals	837	9.3	100.0	Basic chemicals	na	na	na	na	na	na	na

a Revised from C&EN, May 2. b Operating profit is sales less administrative expenses and cost of sales. c Operating profit from chemicals as a percentage of chemical sales. d Chemical operating profit as a percentage of identifiable chemical assets. e Chemical sales include significant amounts of nonchemical products. f Chemical net income. g Fiscal year ends Sept. 30. h Fiscal year ends June 30. i Does not include all chemical sales. j Fiscal year ends Nov. 30. k Sales are only for the period between formation of the company April 6, 1987, and end of fiscal year Sept. 30. l Fiscal year ends Oct. 31. m For fiscal year ended Feb. 28, 1987. na = not available. nm = not meaningful. def = deficit.

changes in rankings last year

Rank 1987	Rank 1986		Chemical sales 1987 ($ millions)	Change from 1986	Chemical sales as % of total sales	Industry classification	Chemical operating profits[b] ($ millions)	Change from 1986	Chemical operating profits as % of total operating profits	Operating profit margin[c]	Identifiable chemical assets ($ millions)	Chemical assets as % of total assets	Operating return on chemical assets[d]
51	44	CF Industries	$810	5.7%	100.0%	Agrochemicals	$ 4	def	100.0%	0.5%	$856	100.0%	0.5%
52	43	Cabot[g]	800	4.1	56.2	Specialty metals	122	−11.2	92.3	15.3	563	38.5	21.7
53	49	Eli Lilly	748	7.1	20.5	Drugs	85	60.2	8.8	11.3	724	13.8	11.7
54	53	International Flavors	746	20.2	100.0	Specialty chemicals	184	27.2	100.0	24.6	665	76.1	27.6
55	51	Morton Thiokol[h]	744	14.2	37.5	Diversified	130	48.5	50.0	17.4	698	41.9	18.6
56	62	Polysar	720	34.5	100.0	Basic chemicals	na	na	na	na	na	na	na
57	50	Engelhard	712	7.0	28.7	Specialty metals	87	13.5	83.2	12.3	677	55.6	12.9
58	56	Georgia Gulf	707	21.3	100.0	Basic chemicals	163	125.0	100.0	23.0	309	100.0	52.7
59	59	Solvay America	700[e]	27.3	100.0	Basic chemicals	na	na	na	na	na	na	na
60	52	Terra Chemicals	679	8.5	100.0	Agrochemicals	na	na	na	na	na	na	na
61	69	American Petrofina	670	51.9	27.0	Petroleum	203	282.3	126.6	30.3	280	15.3	72.5
62	55	Koppers	662	12.4	43.7	Diversified	31	−20.8	22.5	4.7	na	na	na
63	61	Witco	624[i]	14.6	43.7	Specialty chemicals	61	35.6	49.9	9.7	332	31.5	18.2
64	59	Vista Chemical[h]	609	10.7	100.0	Basic chemicals	119	31.2	100.0	19.6	500	100.0	23.8
65	83	Henkel	600	126.4	100.0	Specialty chemicals	na	na	na	na	na	na	na
66	63	H. B. Fuller[j]	597	13.0	100.0	Specialty chemicals	48	20.9	100.0	8.0	330	100.0	14.5
67	—	Avery Inc.[g]	591	nm	98.4	Agrochemicals	na	na	na	na	na	na	na
68	57	Farmland Industries	525	−8.6	20.1	Agricultural supplies	1	def	1.7	0.2	316	40.1	0.4
69	70	Pfizer	514	23.6	10.4	Drugs	70	71.4	6.6	13.6	483	7.0	14.4
70	64	Liquid Air	505	2.8	89.8	Basic chemicals	68	15.7	96.9	13.6	610	81.2	11.2
71	68	CBI Industries	492	9.1	42.4	Construction	68	12.5	82.3	13.7	612	48.3	11.1
72	80	Great Lakes Chemical	478	59.3	100.0	Specialty chemicals	85	99.1	100.0	17.8	577	100.0	14.7
73	66	Henley Manufacturing	464	1.9	76.7	Basic chemicals	39	25.0	101.9	8.5	372	54.2	10.6
73	66	Kerr-McGee	464	1.8	17.8	Petroleum	71	9.2	13.7	15.3	549	19.0	12.9
75	71	Tyler	436	12.4	39.6	Diversified chemicals	37	35.3	55.5	8.4	203	37.4	18.0
76	73	GAF	431	14.3	51.5	Specialty chemicals	130	20.6	82.5	30.1	420	32.3	31.0
76	75	Merck	431	20.1	8.5	Drugs	58	15.4	4.2	13.4	429	7.6	13.4
78	76	Betz Laboratories	386	12.0	100.0	Specialty chemicals	68	6.8	100.0	17.5	287	100.0	23.6
79	77	Sun Co.	371	17.0	3.9	Petroleum	na	na	na	na	na	na	na
80	81	Ferro	362[e]	26.9	41.6	Specialty materials	28	25.7	39.0	7.7	187	35.1	14.9
81	—	Cain Chemical[k]	357	nm	100.0	Basic chemicals	na	na	na	na	na	na	na
82	79	Union Camp	348	14.3	15.1	Diversified	21	236.9	5.6	6.0	279	9.6	7.5
83	82	Loctite	338	26.6	100.0	Specialty chemicals	45	23.3	100.0	13.4	297	97.8	15.3
84	78	Chemed	336	6.9	85.9	Specialty chemicals	41	25.4	84.5	12.3	177	67.1	23.3
85	88	Lonza	312	23.8	100.0	Specialty chemicals	na	na	na	na	na	na	na
86	85	Vulcan Materials	298	17.4	32.2	Nonmetallic mineral	33	68.6	17.9	11.0	na	na	na
87	84	Stepan	289	11.2	100.0	Specialty chemicals	19	37.4	100.0	6.7	173	100.0	11.1
88	89	Dexter Corp.	285	16.5	36.4	Rubber products	29	25.4	30.3	10.3	182	61.9	16.1
89	85	Petrolite[l]	248	−2.2	89.1	Specialty chemicals	21	−6.2	99.2	8.6	181	73.0	11.8
90	91	Sigma-Aldrich	247	24.1	81.2	Specialty chemicals	64	21.1	88.2	25.8	246	86.1	25.9
91	85	KaiserTech	239	−5.9	10.8	Nonferrous metals	16	−51.8	def	6.8	na	na	na
92	92	Essex Chemical	191	3.8	91.4	Basic chemicals	28	−13.3	172.9	14.5	143	64.2	19.3
92	93	Crompton & Knowles	191	15.8	80.3	Specialty chemicals	20	33.1	70.7	10.4	98	72.3	20.2
94	94	Georgia-Pacific	189	21.9	3.3	Wood products	na	na	na	na	na	na	na
95	95	First Mississippi	181	18.5	61.2	Agrochemicals	8	−59.6	80.9	4.4	81	27.4	9.9
96	90	Mississippi Chemical[h]	174	−23.5	101.8	Farm cooperative	−26	def	def	def	230	100.0	def
97	97	Quaker Chemical	148	15.2	100.0	Specialty chemicals	17	21.6	100.0	11.4	118	100.0	14.2
98	96	Agway	133	−6.4	4.1	Farm cooperative	na	na	na	na	na	na	na
99	99	LeaRonal[m]	128	21.6	100.0	Specialty chemicals	13	21.2	100.0	9.8	75	96.3	16.8
100	98	UGI Corp.	116	2.9	27.6	Natural gas	1	def	2.5	1.3	61	10.2	2.4

FINANCIAL ANALYSIS: Solid improvement for most chemical firms in 1987

		Profit margin[a]	Return on investment[b]	Debt as % debt plus equity	% total sales abroad[c]	% total assets abroad[d]	Sales per employee[e]	Dividends as % of net income	CAPITAL SPENDING[f] as % of sales	CAPITAL SPENDING[f] as % of net plant	R&D as % of sales	Sales as % of assets	Net plant as % of gross plant
SALES OVER $1 BILLION													
Air Products[g]	1987	7.5%	2.5%	35.0%	22.0%	26.7%	$176	31.6%	15.1%	16.8%	2.7%	78.9%	33.6%
	1986	6.9	3.3	38.9	19.5	25.0	119	32.9	18.5	20.0	3.1	73.3	53.2
American Cyanamid	1987	6.3	5.2	23.1	37.1	25.6	122	35.4	6.4	19.3	7.5	100.9	48.1
	1986	5.3	4.4	25.4	33.6	24.2	111	43.6	6.9	20.7	7.3	104.1	47.4
Cabot[g]	1987	2.8	1.9	27.2	39.2	20.6	279	65.1	5.7	10.2	2.4	97.3	52.9
	1986	5.6	4.1	41.9	38.4	16.9	198	35.4	5.5	11.3	2.6	86.8	53.0
Dow Chemical	1987	9.3	6.5	39.6	55.6	49.0	252	33.0	7.4	17.9	5.0	93.2	41.1
	1986	6.7	4.3	39.7	53.5	49.4	217	49.1	8.0	16.6	5.4	90.8	42.1
Ethyl	1987	11.2	11.8	38.8	22.0	9.0	172	25.5	8.0	20.5	2.9	86.8	50.4
	1986	11.3	10.7	30.2	19.6	8.7	150	24.0	8.5	22.5	3.0	92.1	49.3
Freeport-McMoRan	1987	16.4	5.5	41.7	na	na	na	20.7	16.5	9.6	na	48.0	65.5
	1986	4.1	0.9	42.0	na	na	na	156.0	19.5	6.6	na	26.7	69.4
B. F. Goodrich	1987	3.9	3.8	25.6	25.2	18.2	181	55.8	6.6	16.0	2.4	111.8	58.5
	1986	0.5	0.6	34.4	19.1	14.3	215	289.9	5.6	16.9	2.2	140.3	58.3
W. R. Grace	1987	3.1	2.7	45.5	37.9	27.8	115	84.0	5.4	14.3	2.4	100.9	47.4
	1986	1.2	0.9	45.6	32.3	16.9	90	263.0	5.3	12.6	2.5	90.9	48.3
Hercules	1987	9.9	6.8	18.2	21.3	12.0	116	36.8	7.6	19.1	2.7	77.1	49.9
	1986	8.7	6.8	24.3	21.1	15.4	104	41.4	9.8	22.3	2.7	89.7	51.4
International Minerals[h]	1987	0.9	0.5	40.7	13.7	13.7	127	276.7	3.8	4.9	3.6	67.3	55.7
	1986	def	def	48.1	13.2	9.7	85	def	8.0	7.5	2.8	48.5	57.7
Lubrizol	1987	8.0	6.7	8.3	55.2	35.9	210	59.3	4.1	14.1	6.1	107.9	42.2
	1986	8.0	7.1	8.4	51.6	31.8	203	59.3	4.1	14.0	5.2	111.3	45.0
Monsanto	1987	5.7	4.5	28.6	36.1	25.1	154	48.6	6.6	16.4	8.1	90.3	45.7
	1986	6.3	4.7	30.1	32.6	21.2	133	46.0	7.6	17.9	8.7	83.2	46.0
Olin	1987	4.0	2.9	35.9	7.3	7.7	137	47.4	6.0	15.8	3.2	114.5	36.2
	1986	4.4	3.0	29.7	6.1	8.6	129	45.6	7.5	17.8	3.3	110.5	37.6
PPG Industries	1987	7.3	5.7	29.7	29.2	28.9	141	34.9	8.2	15.9	4.4	103.9	56.5
	1986	6.8	5.1	32.8	25.5	27.4	128	35.3	7.6	13.4	4.3	101.0	58.2
Pennwalt	1987	4.7	3.8	31.5	28.4	29.7	127	58.6	4.8	12.7	3.9	109.7	47.7
	1986	4.7	3.9	33.6	23.5	21.1	115	68.0	4.9	12.5	4.1	111.1	50.7
Quantum Chemical	1987	5.6	5.0	41.0	na	na	na	50.6	6.0	11.2	na	99.4	67.8
	1986	3.2	1.8	37.6	na	na	na	136.1	5.9	7.3	na	59.6	71.9
Rohm & Haas	1987	8.9	7.2	19.7	41.5	30.0	183	30.3	10.1	30.4	6.4	112.7	41.6
	1986	6.7	5.4	21.7	38.7	28.4	171	39.1	8.7	27.6	6.4	112.2	39.8
Union Carbide	1987	3.4	2.1	69.7	30.9	36.4	160	84.1	7.3	11.6	2.3	87.6	50.3
	1986	2.1	1.2	75.3	28.6	33.2	124	110.8	8.4	12.0	2.4	82.5	51.2
Witco	1987	4.4	4.6	32.1	18.9	15.3	184	40.9	4.8	18.4	1.6	135.2	49.4
	1986	4.8	5.5	17.0	16.7	15.8	169	35.9	4.4	16.3	1.6	165.3	47.8
MEDIAN 1987		**5.6%**	**4.6%**	**32.1%**	**29.2%**	**25.6%**	**$160**	**47.4%**	**6.6%**	**15.9%**	**2.9%**	**99.4%**	**49.4%**
MEDIAN 1986		**5.3%**	**4.1%**	**33.6%**	**25.5%**	**21.1%**	**$129**	**45.6%**	**7.6%**	**16.3%**	**3.1%**	**90.9%**	**50.7%**

Note: Net income is from continuing operations, excluding extraordinary and nonrecurring items where possible. **a** Net income as a percentage of sales. **b** Net income as a percentage of current assets plus gross plant. **c** Consolidated sales only. **d** Foreign identifiable assets as a percentage of total assets. **e** Thousands of dollars. **f** Actual spending on construction of new facilities and purchase of new equipment and land in consolidated businesses. **g** Fiscal year ended Sept. 30. **h** Fiscal year ended June 30. **i** Fiscal year ended Nov. 30. **j** Fiscal year ended Oct. 31. **na** = not available. **def** = deficit.

		Profit margin[a]	Return on investment[b]	Debt as % debt plus equity	% total sales abroad[c]	% total assets abroad[d]	Sales per employee[e]	Dividends as % of net income	CAPITAL SPENDING[f] as % of sales	CAPITAL SPENDING[f] as % of net plant	R&D as % of sales	Sales as % of assets	Net plant as % of gross plant
SALES LESS THAN $1 BILLION													
Betz Laboratories	1987	10.5%	11.3%	0.0%	16.8%	19.7%	$136	57.4%	6.6%	19.0%	3.7%	134.5%	52.4%
	1986	10.3	11.1	0.0	15.4	16.9	130	61.7	6.6	17.4	3.8	127.7	61.2
Chemed	1987	6.0	10.4	29.1	13.1	11.3	71	70.1	2.6	18.4	0.9	129.0	55.9
	1986	2.1	3.4	28.3	12.9	8.7	67	205.9	3.0	20.2	0.9	116.3	58.6
Crompton & Knowles	1987	5.0	7.5	14.5	17.3	23.8	182	33.9	1.5	12.4	2.0	175.7	46.8
	1986	4.2	5.8	22.2	14.4	24.6	163	50.6	1.6	12.3	2.1	158.2	49.4
Essex Chemical	1987	0.9	0.8	64.7	na	na	na	194.4	3.7	9.6	4.2	93.4	61.8
	1986	4.3	4.9	38.3	na	na	na	39.8	5.6	16.9	3.2	127.2	58.4
First Mississippi	1987	6.7	3.5	26.7	24.0	na	na	25.8	7.0	12.8	na	94.1	34.3
	1986	2.6	1.4	36.7	13.6	na	407	66.2	11.8	20.3	1.9	88.4	36.0
H. B. Fuller[i]	1987	4.3	6.7	17.0	45.4	55.8	130	14.7	4.9	23.0	2.1	181.2	61.8
	1986	3.6	5.7	21.5	42.5	53.1	117	17.5	2.5	12.2	2.0	181.5	62.0
GAF Corp.	1987	12.0	10.2	49.2	18.5	15.6	181	3.3	7.9	23.8	1.5	64.5	68.3
	1986	10.7	8.2	44.4	15.3	6.8	na	4.3	4.5	16.3	1.5	56.0	63.2
Georgia Gulf	1987	13.0	25.0	22.6	na	na	712	6.0	1.4	8.3	na	229.2	65.2
	1986	6.7	12.5	51.6	na	na	na	12.3	1.3	6.2	na	220.4	68.4
Great Lakes Chemical	1987	11.6	9.6	9.7	19.2	14.7	na	1.2	7.4	16.1	3.4	82.9	59.5
	1986	8.9	5.1	43.0	21.6	na	na	1.1	6.1	8.7	3.5	61.1	63.1
International Flavors	1987	14.3	10.3	0.0	70.3	50.4	181	46.9	4.9	16.8	6.0	85.3	55.7
	1986	13.8	10.6	0.0	67.9	49.0	163	51.6	4.3	14.3	6.3	92.3	55.8
Lawter International	1987	14.9	13.1	20.6	44.9	36.3	na	58.7	1.3	6.6	2.3	101.9	45.7
	1986	12.5	12.0	7.8	41.7	38.2	280	76.0	1.5	7.1	2.2	110.8	49.1
Liquid Air	1987	6.5	3.8	37.7	41.8	36.9	140	66.0	12.8	14.9	1.1	74.8	56.4
	1986	6.1	3.8	41.9	35.7	38.7	130	70.0	22.9	27.5	1.8	79.5	59.9
Loctite[h]	1987	9.1	9.6	5.5	54.3	57.4	107	27.0	4.6	21.9	3.6	111.3	59.1
	1986	8.7	8.6	8.1	47.3	58.3	100	31.0	3.5	16.1	3.8	109.3	58.6
Nalco Chemical	1987	9.5	9.0	13.0	26.1	21.8	166	58.8	6.8	18.8	4.2	112.7	50.1
	1986	8.7	8.4	6.7	23.9	22.3	151	73.9	8.6	22.7	4.5	125.5	51.2
Petrolite[j]	1987	4.3	3.3	1.4	31.8	32.8	na	107.6	6.8	19.4	4.3	112.2	45.0
	1986	6.3	5.3	2.9	22.8	25.1	na	74.3	9.0	28.3	4.3	121.7	44.2
Quaker Chemical	1987	7.0	8.2	6.0	40.7	31.3	153	32.7	2.5	11.3	5.7	124.7	54.5
	1986	6.6	7.7	11.5	36.3	28.9	138	35.3	4.0	17.3	5.5	130.1	57.4
Sigma-Aldrich	1987	13.7	12.8	7.3	16.8	16.1	105	16.9	6.8	21.2	na	106.9	68.7
	1986	13.4	12.4	9.5	14.9	14.7	94	17.9	14.0	41.2	na	103.3	71.9
Stepan	1987	3.8	4.1	42.6	na	na	288	21.8	8.9	26.0	3.9	167.3	49.5
	1986	2.9	3.2	38.8	na	na	274	28.0	5.5	16.7	3.6	170.0	49.1
Vista Chemical[g]	1987	8.0	8.9	53.9	6.4	na	361	2.5	3.4	7.8	na	121.8	77.0
	1986	5.5	6.1	78.1	5.0	na	367	6.3	2.9	5.8	na	113.4	83.8
MEDIAN 1987		**8.0%**	**9.0%**	**17.0%**	**25.1%**	**27.6%**	**$160**	**32.7%**	**4.9%**	**16.8%**	**3.6%**	**112.2%**	**55.9%**
MEDIAN 1986		**6.6%**	**6.1%**	**22.2%**	**22.2%**	**25.1%**	**$145**	**39.8%**	**4.5%**	**16.7%**	**3.4%**	**116.3%**	**58.6%**

Capital spending by U.S. chemical producers increased in 1987. Many producers, particularly those making commodity petrochemicals, have been utilizing virtually all their existing capacity. Despite problems in the automobile and housing industries, commodity chemicals such as propylene, vinyl chloride, and acrylonitrile are in strong demand.

Mindful of industry overbuilding in the 1970s, however, chemical producers have proceeded cautiously in expanding capacity and have committed more money to debottlenecking projects at present plants to bring on increased capacity at lower cost than in building new ones. Producers in some cases also are reopening mothballed plants in order to supply markets. Tenneco expects to reopen an idled methanol plant and Texaco plans to modernize and reactivate idle ethylene cracking capacity, for example.

For 26 chemical makers surveyed by C&EN, capital expenditures increased 7% last year. Some producers increased their spending significantly, among them Air Products, Dow Chemical, Du Pont, W. R. Grace, Hercules, PPG Industries, Quantum Chemical, and Rohm & Haas. Many also plan capital expenditure increases for 1988 because they think the weak U.S. dollar will allow them to expand their growing export volume and, at the same time, undercut demand for increasingly expensive foreign-produced chemicals in the U.S.

However, the Commerce Department reports that its broader survey of chemicals and allied products producers shows that capital spending declined 3% in 1987, although this number is subject to later revision. But Commerce's survey of 1988 spending plans by the

INDUSTRY CAPITAL SPENDING: Chemical industry plans significant increase for 1988

$ Billions	1988[a]	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978
Chemicals	$ 17.75	$ 16.37	$ 16.81	$ 16.44	$ 15.32	$ 12.96	$ 12.66	$ 13.11	$ 11.63	$ 9.81	$ 7.76
Iron and steel	5.45	4.63	3.82	4.12	3.54	3.25	3.78	3.48	3.44	3.21	2.60
Nonferrous metals	2.50	2.14	1.93	1.88	2.13	1.74	1.90	2.51	2.13	1.65	1.46
Paper	11.29	8.92	8.77	8.59	7.21	5.92	5.60	6.11	6.52	5.24	3.80
Petroleum	18.81	16.94	17.92	26.71	25.53	23.14	26.39	25.98	19.57	15.24	13.16
Rubber	3.67	3.52	3.89	3.86	3.11	2.46	2.16	2.15	2.03	2.46	2.33
Stone, clay, glass	3.45	3.36	3.14	3.40	3.09	2.77	2.90	3.41	3.98	3.99	3.15
All manufacturing	159.68	145.46	142.69	153.48	138.82	116.20	120.68	126.54	112.33	95.92	75.58

a Estimate. **Source:** Department of Commerce

Industry's backlog of unspent funds expanded in 1987

$ Billions	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
Chemicals	$ 7.0	$ 6.2	$ 8.0	$ 7.8	$ 7.5	$ 7.4	$ 9.4	$ 9.8	$ 8.5	$ 7.2	$ 7.4
Iron and steel	1.4	0.5	1.1	2.1	2.2	2.7	5.4	3.9	4.5	4.0	3.6
Nonferrous metals	1.7	1.6	2.3	2.5	3.2	3.2	3.7	3.7	2.9	2.7	2.9
Paper	6.3	4.4	4.3	5.9	4.0	5.1	5.1	4.0	4.2	3.2	2.6
Petroleum	15.2	16.7	26.2	24.7	22.3	22.9	29.7	26.7	16.1	14.6	15.0
Rubber	1.7	1.9	3.1	1.6	1.1	1.0	0.9	1.0	0.9	0.9	0.8
Stone, clay, glass	2.4	1.8	2.0	2.2	1.5	1.6	1.9	2.0	2.3	2.4	2.0
All manufacturing	76.8	69.7	95.0	94.4	73.7	70.8	92.7	91.9	76.7	63.4	56.5

Note: Figures are for fourth quarter of each year. **Source:** Conference Board

Overseas spending by chemical producers continues to grow

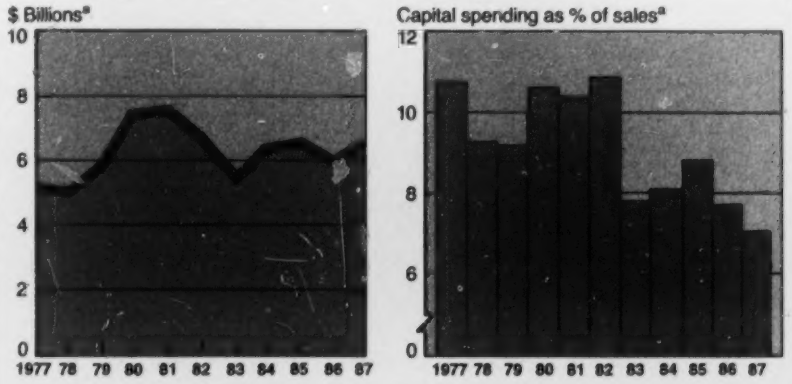
$ Billions[a]	1988[b]	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978
Chemicals and allied products	$ 3.8	$ 3.3	$ 3.1	$ 2.7	$ 2.4	$ 2.3	$ 2.8	$ 3.0	$ 3.0	$ 2.6	$ 1.9
Metals, primary and fabricated	1.0	0.8	0.9	0.9	1.0	0.9	0.9	0.8	0.9	0.6	0.6
Petroleum	12.3	10.3	9.6	13.7	14.1	15.9	19.7	15.8	14.8	11.0	9.5
All manufacturing	19.6	16.8	16.4	14.9	13.6	13.6	16.8	19.2	19.5	15.4	12.0

a By majority-owned affiliates of U.S. companies. b Planned. **Source:** Department of Commerce

chemical industry indicates that its capital expenditures will rise 8% this year, the biggest year-to-year jump since 1984.

U.S. producers, meanwhile, have not concentrated on their U.S. plants to the exclusion of foreign installations. Mindful of maintaining market share in an increasingly global market, foreign affiliates of U.S. chemical companies have boosted their plant outlays steadily during the past five years. U.S. chemical companies increased capital expenditures abroad 6% in 1987 and plan an additional large increase of 15% in 1988.

Chemical capital spending increased in 1987, but continued to fall as a percentage of sales



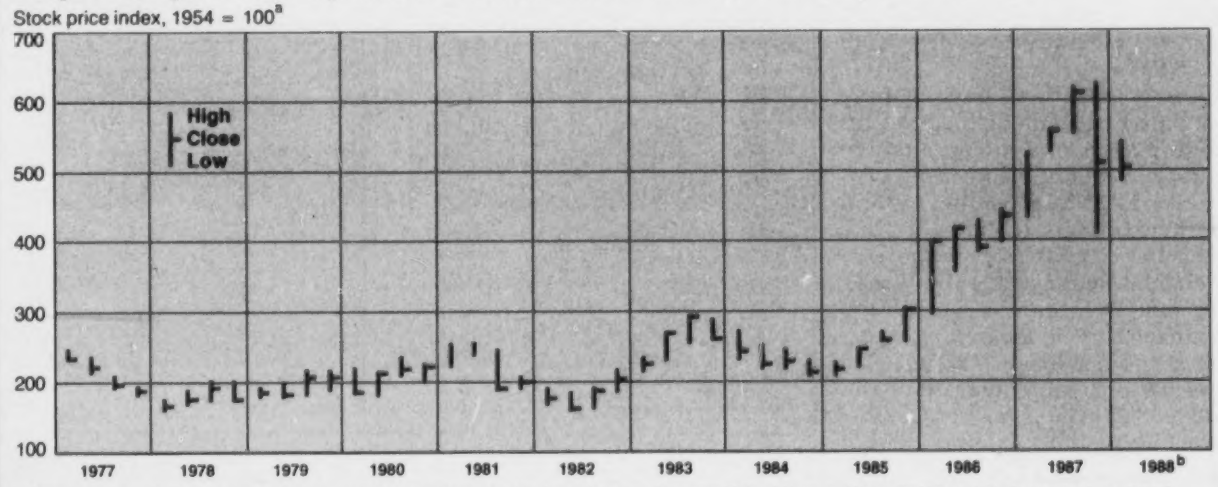
a Worldwide data for 26 major chemical producers. **Source:** Company data

CHEMICAL CAPITAL SPENDING: Bounced back in 1987 to highest level in five years

$ Millions	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
Air Products	$ 323	$ 367	$ 392	$ 263	$ 246	$ 347	$ 323	$ 364	$ 246	$ 200	$ 143
American Cyanamid	268	263	203	200	165	171	181	196	235	251	235
Cabot[a]	83	80	184	505	80	152	194	137	98	128	51
Chemed	9	9	7	9	5	4	4	4	6	3	3
Crompton & Knowles	4	4	3	3	2	3	7	10	8	5	2
Dow Chemical	995	890	806	781	630	829	1176	1184	1268	1075	1163
Du Pont[b]	1824	1587	1515	1319	1276	1300	1420	1297	864	714	704
Essex Chemical	8	12	9	7	11	25	10	6	4	4	2
Ethyl	139	134	90	103	85	92	141	156	123	96	88
B. F. Goodrich	143	144	202	153	115	144	205	184	192	115	106
W. R. Grace	243	199	348	380	353	560	657	658	514	313	279
Great Lakes Chemical	35	18	21	29	20	29	47	21	18	9	12
Hercules	205	257	234	218	168	174	167	229	186	116	127
Loctite	15	9	11	6	10	11	13	14	9	6	4
Lubrizol	42	41	40	30	25	52	75	92	51	44	23
Monsanto	505	520	645	614	560	673	668	781	566	480	607
Nalco Chemical	57	64	60	53	41	56	59	35	39	34	33
Olin	115	128	154	165	123	129	186	172	161	163	208
Pennwalt	55	54	90	87	70	76	53	53	66	61	45
Petrolite	19	25	24	11	9	24	15	17	12	7	21
PPG Industries	426	356	452	315	450	452	376	401	252	261	212
Quantum Chemical	154	102	76	116	71	66	44	49	58	106	88
Rohm & Haas	222	179	159	124	72	126	182	93	68	66	79
Stepan	26	14	19	12	10	16	12	9	14	14	16
Union Carbide	502	524	649	670	761	1179	1186	1129	831	688	805
Witco	69	60	76	85	55	54	83	73	49	51	29
TOTAL	$6486	$6040	$6469	$6258	$5413	$6744	$7484	$7364	$5938	$5010	$5085
ANNUAL CHANGE	7%	−7%	3%	16%	−20%	−10%	2%	24%	19%	−1%	−5%

Note: Figures are for worldwide spending on construction, equipment, and land in consolidated businesses. Where possible, acquisition costs and investments in nonconsolidated businesses are excluded. a Includes acquisitions and investments. b Excludes Conoco. **Source:** Company data

Despite collapse last fall, prices of chemical stocks held well above pre-1987 level



a C&EN weighted stock price index of American Cyanamid, Dow Chemical, W. R. Grace, Hercules, Monsanto, Rohm & Haas, and Union Carbide; weighted according to number of shares outstanding for each company. b First quarter.

SHIPMENTS: Strong recovery in industrial chemicals pushed chemicals overall to new high

$ Billions	1987[a]	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
All manufacturing industries	$2408.6	$2273.3	$2279.1	$2254.4	$2054.9	$1960.2	$2017.5	$1852.7	$1727.2	$1523.4	$1358.4	6%	6%
Chemicals and allied products	214.6	198.3	197.3	198.2	183.2	170.7	180.5	162.5	147.7	129.8	118.2	8	6
Industrial chemicals[b]	62.7	56.4	59.6	61.5	56.6	53.2	62.7	57.3	52.3	44.8	41.5	11	4
Drugs, soap, and toiletries	72.5	69.2	60.9	57.5	54.4	50.7	46.9	41.9	36.7	34.7	30.6	5	9
Petroleum and coal products	129.7	129.3	179.1	189.0	192.6	208.9	224.1	198.7	148.4	103.9	97.5	0	3
Rubber and plastics products, nec	78.9	72.2	71.3	69.5	60.3	55.4	53.2	47.3	46.8	43.2	39.6	9	7
Paper and allied products	118.9	103.8	93.4	94.8	84.6	79.9	80.2	72.8	65.2	57.0	52.1	15	9

a Preliminary. b Excluding pigments. nec = not elsewhere classified. **Source:** Department of Commerce

PRICES: Higher for chemicals generally but industrial and ag chemicals remain depressed

Producer price indexes,[a] 1982 = 100	Annual average 1987[b]	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977	Annual change 1986–87	Annual change 1977–87
All commodities	102.8	100.2	103.1	103.7	101.3	100.0	98.0	89.8	78.7	69.9	64.9	3%	5%
Industrial commodities	102.6	99.9	103.7	103.3	101.1	100.0	97.4	88.0	75.7	67.0	62.5	3	5
Chemicals and allied products	106.4	102.5	103.7	102.9	100.2	100.0	98.4	89.1	76.1	68.0	66.0	4	5
Industrial chemicals	95.5	91.5	96.0	96.8	97.3	100.0	103.0	91.9	74.9	64.0	63.5	4	4
Prepared paint	108.1	107.0	105.3	103.7	100.7	100.0	95.0	89.5	77.8	73.1	69.4	1	5
Paint materials	107.3	104.4	109.5	108.2	100.3	100.0	98.5	89.9	79.2	69.8	67.6	3	5
Drugs and pharmaceuticals	139.1	129.9	122.2	114.2	107.7	100.0	92.1	83.1	75.9	70.5	66.9	7	8
Fats and oils, inedible	92.7	80.5	110.6	139.1	106.2	100.0	110.7	111.6	141.1	118.3	104.5	15	−1
Agricultural chemicals and chemical products	96.4	94.2	96.2	97.4	96.0	100.0	97.5	87.9	73.3	67.8	64.2	2	4
Plastic resins and materials	110.3	104.4	107.5	108.9	102.4	100.0	102.0	98.5	83.2	70.5	69.1	6	5
Other chemicals and allied products	107.0	105.8	105.2	102.7	101.3	100.0	94.1	83.1	71.0	67.3	65.0	1	5
Rubber and plastics products	103.0	101.9	101.9	102.2	100.8	100.0	96.4	90.1	80.5	72.4	69.4	1	4

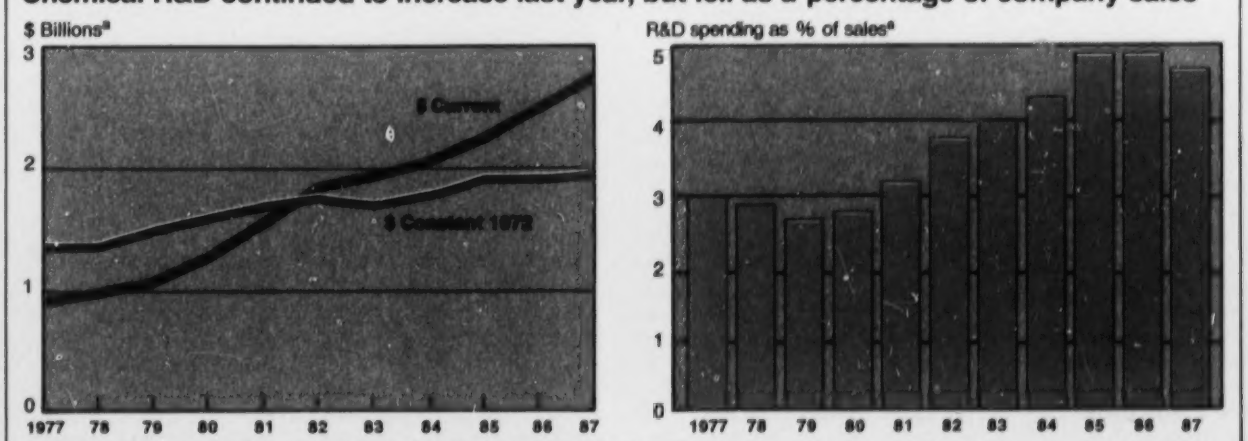
a Formerly called "wholesale price indexes." b Preliminary. **Source:** Department of Labor

R&D SPENDING: Most chemical producers budgeted more last year

$ Millions	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
CHEMICAL COMPANIES											
Air Products	$ 57	$ 61	$ 51	$ 44	$ 40	$ 37	$ 32	$ 30	$ 24	$ 23	$ 24
American Cyanamid	314	278	251	232	208	185	166	148	130	108	96
Dow Chemical	670	605	547	507	492	460	404	314	269	232	203
Ethyl	50	47	47	40	39	39	37	34	29	25	28
W. R. Grace	107	94	92	81	73	64	57	45	42	37	32
Hercules	74	71	76	72	74	74	65	57	50	43	40
International Flavors	45	39	34	32	32	31	30	29	27	24	20
Lubrizol	62	51	44	33	37	36	33	28	23	21	19
Monsanto	615	596	470	370	290	264	233	208	161	136	132
Nalco Chemical	35	33	32	32	30	33	30	28	21	17	14
Olin	62	56	53	52	49	45	38	31	26	25	25
Pennwalt	45	45	39	36	33	31	27	24	22	23	21
Petrolite	12	12	12	12	13	10	8	7	6	5	5
PPG Industries	227	204	176	150	127	127	119	103	83	70	61
Rohm & Haas	142	133	124	109	100	92	77	67	54	49	45
Union Carbide	159	148	275	265	245	240	207	166	161	156	156
TOTAL	**$2678**	**$2473**	**$2323**	**$2067**	**$1882**	**$1768**	**$1563**	**$1319**	**$1128**	**$994**	**$921**
ANNUAL CHANGE	**8%**	**6%**	**12%**	**10%**	**6%**	**13%**	**18%**	**17%**	**13%**	**8%**	**11%**
PHARMACEUTICAL & DIVERSIFIED COMPANIES											
Allied-Signal	667	734	470	389	383	177	152	105	70	56	51
Du Pont	1223	1156	1144	1097	966	879	718	591	509	461	367
Eastman Kodak	992	1059	976	838	746	710	615	520	459	389	351
Eli Lilly	466	427	370	341	294	267	235	201	178	150	127
FMC	132	146	149	121	102	105	94	81	69	54	44
Merck & Co.	566	480	426	393	356	320	274	234	188	161	145
Morton Thiokol	40	38	34	28	21	7	6	6	5	4	4
Pfizer	401	336	287	255	230	199	179	162	139	117	101
Upjohn	356	314	284	247	218	185	162	139	122	109	96
TOTAL	**$4843**	**$4690**	**$4140**	**$3709**	**$3316**	**$2849**	**$2435**	**$2039**	**$1739**	**$1501**	**$1286**
ANNUAL CHANGE	**3%**	**13%**	**12%**	**12%**	**16%**	**17%**	**19%**	**17%**	**16%**	**17%**	**7%**

Note: Prior years not restated to reflect company revisions. **Source:** Company data

Chemical R&D continued to increase last year, but fell as a percentage of company sales



a R&D spending by 16 major chemical producers. **Sources:** Company data, Battelle Columbus Laboratories

INDUSTRY BALANCE SHEET: Hike in current assets overshadowed by rise in liabilities

Industrial chemicals and synthetics

Assets	1987 ($ billions)	1986 ($ billions)	Change
Current assets			
Cash	$ 1.67	$ 2.52	−34%
Short-term securities	1.66	0.95	74
Receivables	14.66	11.69	25
Inventories	12.36	11.21	10
Other current assets	3.65	3.08	19
Total	**34.00**	**29.45**	**15**
Fixed assets			
Depreciable fixed assets	82.00	77.42	6
Land and mineral rights	3.04	2.87	6
Less: accumulated depreciation and depletion	43.80	41.51	6
Net fixed assets	**41.24**	**38.78**	**6**
Other assets, including investments and intangibles	**29.67**	**22.76**	**30**
TOTAL ASSETS	**$104.91**	**$90.99**	**15%**

Liabilities and stockholders' equity	1987 ($ billions)	1986 ($ billions)	Change
Current liabilities			
Short-term debt	$ 3.94	$ 3.26	21%
Accounts payable	7.58	5.76	32
Accrued income taxes	1.85	1.30	42
Current portion of long-term debt	1.47	0.85	74
Other current liabilities	9.77	8.87	10
Total	**24.61**	**20.04**	**23**
Long-term debt	**25.65**	**20.83**	**23**
Other noncurrent liabilities, including deferred taxes and minority interest	**9.73**	**8.53**	**14**
TOTAL LIABILITIES	**59.99**	**49.40**	**21**
Stockholders' equity			
Capital stock and other capital	15.59	14.87	5
Retained earnings	29.32	26.72	10
TOTAL STOCKHOLDERS' EQUITY	**44.91**	**41.59**	**8**
TOTAL LIABILITIES AND STOCKHOLDERS' EQUITY	**$104.91**	**$90.99**	**15%**

Source: Bureau of the Census

DEBT RATIOS: Climbed steadily in recent years in the chemical industry, as well as elsewhere

$ Billions	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
INDUSTRIAL CHEMICALS AND SYNTHETICS											
Long-term debt	$25.7	$20.8	$19.2	$18.1	$19.4	$22.0	$21.4	$16.8	$14.8	$13.6	$12.3
Stockholders' equity	$44.9	$41.6	$40.8	$46.5	$45.3	$45.9	$42.5	$39.8	$32.3	$29.3	$26.3
Debt ratio[a]	36.4%	33.4%	32.0%	28.0%	30.0%	32.4%	33.5%	29.6%	31.4%	31.8%	31.9%
CHEMICALS AND ALLIED PRODUCTS											
Long-term debt	$51.0	$46.8	$36.2	$33.8	$36.2	$38.2	$36.9	$28.3	$24.9	$32.5	$21.1
Stockholders' equity	$106.1	$100.8	$100.3	$100.3	$97.2	$95.3	$89.9	$79.5	$67.4	$60.8	$54.9
Debt ratio[a]	32.5%	31.7%	27.6%	25.2%	27.2%	28.6%	29.1%	26.3%	27.0%	27.9%	27.8%
ALL MANUFACTURING											
Long-term debt	$449.2	$407.5	$367.0	$324.2	$286.6	$293.1	$266.5	$236.2	$204.8	$182.0	$167.3
Stockholders' equity	$912.3	$878.1	$870.7	$883.6	$837.6	$783.0	$762.3	$699.7	$624.0	$560.8	$511.7
Debt ratio[a]	33.0%	31.7%	29.6%	26.8%	25.5%	27.2%	25.9%	25.2%	24.7%	24.5%	24.6%

Note: Because of changes in accounting rules and industry classifications, numbers over the entire range of years are not strictly comparable. a Long-term debt as a percentage of long-term debt plus stockholders' equity. **Source:** Bureau of the Census

CASH FLOW: Profits, depreciation regained traditional status as chief sources of company funds

$ Millions, % of total	1987		1986		1985		1984		1983	
SOURCES OF FUNDS										
Net income	$ 5,697	29.6%	$ 3,414	13.6%	$ 986	6.5%	$ 3,859	29.7%	$ 2,795	23.1%
Depreciation and depletion	5,264	27.5	5,117	20.4	5,010	32.8	4,710	36.2	4,601	38.0
Deferred taxes	311	1.6	568	2.3	−34	−0.2	507	3.9	333	2.7
Other internal sources	4,272	22.2	6,084	24.3	6,707	43.9	2,357	18.1	2,623	21.7
Long-term debt	2,949	15.3	8,773	35.0	2,356	15.4	1,441	11.1	1,352	11.2
Stock	732	3.8	1,091	4.4	264	1.7	136	1.0	396	3.3
TOTAL	**$19,245**	**100.0%**	**$25,047**	**100.0%**	**$15,289**	**100.0%**	**$13,009**	**100.0%**	**$12,100**	**100.0%**
APPLICATIONS OF FUNDS										
Dividends	$ 2,181	11.3%	$ 1,992	8.0%	$ 2,049	13.4%	$ 1,998	15.4%	$ 1,868	15.4%
Capital expenditures	6,437	33.5	5,986	23.9	6,500	42.5	6,400	49.2	5,685	47.0
Additions to working capital	2,879	15.0	−567	−2.3	49	0.3	−436	−3.4	−265	−2.2
Reduction of long-term debt	2,564	13.3	7,669	30.6	2,555	16.7	2,529	19.4	3,249	26.9
Other applications	5,184	26.9	9,966	39.8	4,137	27.1	2,518	19.4	1,563	12.9
TOTAL	**$19,245**	**100.0%**	**$25,047**	**100.0%**	**$15,289**	**100.0**	**$13,009**	**100.0%**	**$12,100**	**100.0%**

Note: Data are totals for 12 major chemical producers: American Cyanamid, Dow Chemical, Du Pont, Ethyl, W. R. Grace, Hercules, Monsanto, Olin, Pennwalt, Quantum Chemical (formerly National Distillers), Rohm & Haas, and Union Carbide. **Sources:** Company annual reports

For U.S. chemical companies, 1987 was the year to draw down the dividends for the radical reorganization that many of them had undertaken two or three years earlier. The industry's austerity and restructuring programs, which reached their apex in 1985, drastically changed the organization of the industry. But the nonrecurring costs that companies charged off during the process left several corporate earnings statements severely depressed or even, temporarily and at least on paper, awash with red ink. The end result, however, was a more streamlined and much more efficient industry, one that was well-positioned to profit mightily from the steadily increasing demand for chemicals of the past few years.

This improvement is clearly evident in the financial results presented for individual companies on this and the following four pages. With only a handful of exceptions, chemical companies chalked up higher earnings last year, and in the process widened their profit margins and return on stockholders' equity.

Some of the most stunning gains were registered by companies relatively new to the industry—companies like Arco Chemical, Aristech, and Georgia Gulf—that were spun off in the past few years by parents whose prime focus was in other industries. These firms have benefited greatly, to be sure, by the remarkable recovery for commodity petrochemicals since they became independent. But they also have been the beneficiaries of more focused management and more flexible and cost-conscious corporate organizations.

Explanation of table headings

Year. Data are for calendar year unless otherwise indicated.

Net sales. Gross sales, less discounts, allowances, and returns; generally excludes excise taxes and other operating income or revenues.

Net income. Net sales and other income, less operating costs, nonoperating charges, depreciation, depletion, interest expense, deferred charges, minority interest in income, and taxes. Nonrecurring or extraordinary credits and charges have been excluded in most cases, but these items are indicated by a footnote.

Total assets. Sum at year's end of current assets, investments, prepaid expenses, net plant and equipment, and other tangible assets. Excludes insofar as possible intangible assets including goodwill, value of patents and trademarks, and the like.

Current ratio. The ratio of current assets (cash, marketable securities, receivables, and inventories but excluding prepaid expenses) to total current liabilities.

Net plant and equipment. Value at year's end of fixed assets, less accumulated depreciation, amortization, and depletion.

Capital expenditures. Total spending during the year for new fixed assets, such as plant, equipment, and land, and for replacement and modernization of facilities.

Net worth. Equity at year's end of preferred and common stock holders, including value of capital stock, capital and earned surplus, and surplus reserves, as well as contingency and miscellaneous reserves for which no definite purpose is stated. Intangible assets are deducted insofar as possible.

Net income (breakdown). **Percent of sales:** net income divided by net sales. **Percent of net worth:** net income divided by tangible net worth. **Dollars per share:** net income, less preferred dividends, divided by the number of shares of common stock outstanding. All figures are adjusted for stock splits, but no adjustment has been made for earlier years as a result of stock dividends or for dilution that might result from the conversion of preferred stock or debt to common stock or the exercise of stock options outstanding.

Dividends per share. Cash dividends paid (or declared) on each share of common stock; excludes the value of stock dividends, which are indicated by a footnote.

Dividend yield. Dividends per share divided by the average of the high and low prices of the common stock during the calendar year.

Stock price range. High-low market prices of common stock during the calendar year, adjusted for stock splits but not for stock dividends.

Price-earnings ratio. Average of the high and low prices of the common stock during the calendar year divided by net income per share.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME: % of sales	NET INCOME: % of net worth	NET INCOME: $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	Money figures in thousands of dollars unless otherwise indicated													
CHEMICALS														
Air Products & Chemicals														
1987[a]	$2,132,176	$159,688[b]	$2,695,625	1.2	$1,920,520	$322,765	$1,140,512	7.5%	14.0%	$2.83[b]	$0.90	2.2%	$53⅞–29	14.6
1986[a]	1,982,134	4,735[c]	2,700,151	1.4	1,829,122	366,563	1,094,562	0.2	0.4	0.08[c]	0.77	2.2	41⅛–29⅛	442.2
1985[a]	1,829,588	143,484[d]	2,539,545	1.1	1,782,267	392,176	1,109,068	7.8	12.9	2.38[d]	0.635	2.3	34¼–22¼	11.9
1984[a]	1,735,115	140,618	2,257,457	1.1	1,587,382	262,491	1,058,328	8.1	13.3	2.28	0.525	2.5	24¼–18¼	9.3
American Cyanamid Co.														
1987	$4,166,100	$264,000[e]	$3,878,400	1.5	$1,391,900	$258,100	$1,622,400	6.3%	16.3%	$2.89	$1.025	2.4%	$ 57–29	14.9
1986	3,815,900	202,500	3,482,400	1.7	1,267,700	252,500	1,536,000	5.3	13.2	2.18	0.95	2.6	44⅞–27⅛	16.5
1985	3,536,100	120,200[f]	3,383,400	2.0	1,126,900	202,500	1,523,000	3.4	7.4	1.25[f]	0.95	3.5	29⅝–24	21.4
1984	3,856,726	215,918	3,304,027	1.9	1,241,927	200,110	1,645,122	5.6	13.1	2.21	0.93	3.9	26½–21	10.8
Arco Chemical Co.														
1987[g]	$1,952,000	$257,000	$2,534,000	1.3	$984,000	$295,000	$1,116,000	13.2%	23.0%	$2.58[h]	$0.20	0.7%	$38¾–17	10.8
1986	1,841,000	143,000	1,450,000	2.6	752,000	167,000	952,000[i]	9.3	15.0	1.44[h]	—	—	—	
1985	1,589,000	89,000	1,278,000	—	—	86,000	879,000[i]	5.6	10.1	—	—	—	—	
1984	1,507,000	115,000	1,252,000	—	—	—	—	7.6	—	—	—	—	—	
Aristech Chemical Corp.														
1987	$ 918,800	$ 69,700	$ 551,200	2.5	$ 299,700	$ 43,700	$ 362,700	7.6%	19.2%	$2.71	$0.54	1.9%	$ 39–16⅜	10.3
1986[j]	750,800	47,600	476,100	1.9	286,300	15,600	309,700	6.3	15.4	1.70[k]	0.00	0.0	18⅝–17¼	10.7
1985	789,100	20,500	452,400	2.5	303,200	17,900	262,900[k]	2.6	7.8	0.65[k]	—	—	—	—
1984	862,300	42,600	465,800	—	—	9,100	270,600[k]	4.9	15.7	—	—	—	—	—

a Fiscal year ends Sept. 30. b Excludes extraordinary net loss on extinguishment of debt of $4.1 million ($0.07 per share). c Includes special charges for writedown of assets, revaluation of South African investment, and staff reduction program of $132.2 million ($2.25 per share) and for loss of investment tax credits of $7 million ($0.13 per share). d Includes special charges, before taxes, of $300,000. e From continuing operations; excludes net income from discontinued operations of $11.6 million ($0.13 per share) but includes gain on sale of fragrance and skin care businesses, before taxes, of $12.0 million ($0.13 per share). f From continuing operations; excludes net income and gain on sale of Formica Brand Products Group of $8.9 million ($0.09 per share). g Arco Chemical, previously a subsidiary of Atlantic Richfield Co., became an independent, publicly owned company on Oct. 5. h Pro forma. i Atlantic Richfield equity investment. j Aristech Chemical, previously the USS Chemicals division of USX Corp., became an independent, publicly owned company on Dec. 4. k USX Corp. equity investment.

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME: % of sales	NET INCOME: % of net worth	NET INCOME: $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
	(Money figures in thousands of dollars unless otherwise indicated)													
Betz Laboratories														
1987	$ 385,868	$ 40,634	$ 275,664	1.7	$ 153,200	$ 25,428	$ 193,959	10.5%	20.9%	$2.59	$1.46	3.1%	$ 58¼–35	18.0
1986	344,377	35,544	267,681	2.3	144,053	22,750	202,104	10.3	17.6	2.23	1.36	3.4	44⅜–35	17.9
1985	319,381	36,792	253,704	2.2	137,255	27,030	194,793	11.5	18.9	2.33	1.26	3.7	38¼–30¼	14.7
1984	303,888	36,737	220,662	2.1	123,296	25,302	170,684	12.1	21.5	2.33	1.10	3.3	39–27¼	14.2
Cabot Corp.														
1987[a]	$ 1,424,041	$ 39,235[b]	$ 1,447,001	1.2	$ 794,470	$ 81,087	$ 574,610	2.8%	6.8%	$1.42[b]	$0.92	2.5%	$ 49¼–25¼	26.2
1986[a]	1,309,915	73,061[c]	1,490,759	2.0	642,137	72,551	572,145	5.6	12.8	$2.56[c]	0.92	3.1	35⅜–23⅜	11.5
1985[a]	1,407,516	71,290[d]	1,573,086	1.9	623,211	141,559	604,085	5.1	11.8	2.22[d]	0.92	3.4	33¾–20½	12.2
1984[a]	1,752,523	97,073	1,730,722	1.8	1,051,251	116,911	699,167	5.5	13.9	3.02	0.92	3.6	28⅞–22⅝	8.5
Chemed Corp.														
1987	$ 391,004	$ 20,362	$ 220,549	1.5	$ 48,545	$ 8,893	$ 69,944	5.2%	29.1%	$2.28	$1.60	4.5%	$ 44⅛–26⅜	15.5
1986	359,476	6,830[e]	229,316	1.6	46,554	9,385	75,339	1.9	9.1	0.76[e]	1.56	4.4	40–30⅛	46.1
1985	372,677	21,858	197,615	1.7	42,092	7,874	58,234	6.6	37.5	2.49	1.52	5.1	33⅜–25⅜	11.9
1984	346,140	20,110	180,518	1.7	45,517	9,198	49,822	5.8	40.4	2.29	1.48	4.7	36⅜–25⅜	13.6
Crompton & Knowles Corp.														
1987	$ 237,469	$ 11,750	$ 127,689	2.2	$ 29,085	$ 3,632	$ 58,265	4.9%	17.2%	$1.95	$0.67	2.8%	$ 30¼–18	12.4
1986	213,242	8,923[f]	126,881	2.2	28,511	3,514	60,565	4.2	14.5	1.32[f]	0.63	4.0	19⅝–12¼	12.0
1985	231,225	7,575	120,076	2.5	30,376	3,362	63,839	3.3	11.9	1.10	0.60	5.3	13⅝–9¼	10.3
1984	230,434	7,891	114,135	2.5	30,809	3,917	59,586	3.4	13.2	1.15	0.57	5.3	11⅞–9⅝	9.3
Dow Chemical Co.														
1987	$13,377,000	$1,245,000[g]	$13,871,000	1.7	$ 5,551,000	$ 995,000	$ 5,284,000	9.3%	23.6%	$6.50[g]	$2.10	2.5%	$109⅝–58⅛	13.0
1986	11,113,000	741,000[h]	11,939,000	1.6	5,347,000	890,000	4,865,000	6.7	15.2	3.87[h]	1.85	3.6	61⅜–39⅞	13.1
1985	10,500,000	58,000	11,565,000	1.5	5,127,000	806,000	4,527,000	0.6	1.3	0.31	1.80	5.2	41⅞–27	111.1
1984	10,679,000	549,000[i]	11,217,000	1.5	5,173,000	781,000	4,660,000	5.1	11.3	2.83[i]	1.80	6.0	34½–25⅝	10.6
E. I. du Pont de Nemours & Co.														
1987	$30,468,900	$1,786,000	$27,603,000	1.5	$15,854,000	$3,035,000	$13,639,000[j]	5.9%	13.1%	$7.39	$3.30	3.2%	$ 131–75	13.9
1986	27,148,000	1,538,000	26,083,000	1.5	15,697,000	2,737,000	12,724,000	5.7	12.1	6.35	3.05	4.0	92½–59½	12.0
1985	29,483,000	1,118,000	25,108,000	1.6	15,195,000	3,046,000	12,527,000	3.8	8.9	4.61	3.00	5.1	69⅝–47⅝	12.7
1984	35,915,000	1,431,000	24,098,000	1.6	14,409,000	2,931,000	12,233,000	4.0	11.7	5.93	2.90	6.1	52⅞–42⅝	8.0
Essex Chemical Corp.														
1987	$ 208,766	$ (2,748)[k,l]	$ 207,058	1.0	$ 81,002	$ 7,895	$ 26,065	—	—	$(0.35)[k,l]	$0.49	2.4%	$ 28–12⅜	—
1986	205,624	8,836	159,499	1.3	68,830	11,614	57,336	4.3%	15.4%	1.15	0.46	2.5	23⅜–12⅞	15.8
1985	190,049	8,502	140,195	2.1	64,161	8,788	50,617	4.5	16.8	1.12	0.42	3.3	15⅜–9¾	11.3
1984	175,833	9,092[m]	135,654	2.2	62,469	6,848	44,885	5.2	20.3	1.20[l]	0.38	3.5	13¼–8¾	8.8
Ethyl Corp.														
1987	$ 1,720,338	$ 193,319	$ 1,875,614	2.2	$ 674,075	$ 138,481	$ 852,799	11.2%	22.7%	$1.57	$0.40	1.7%	$ 32¼–15	15.0
1986	1,579,254	177,734	1,667,825	2.1	594,238	133,700	895,790	11.3	19.8	1.40	0.335	1.8	22¾–13½	12.9
1985	1,547,034	117,146[n]	1,509,988	2.0	557,256	89,512	754,853	7.6	15.5	0.92	0.285	2.5	15¼–7⅞	12.6
1984	1,675,059	132,184[o]	1,437,207	2.2	573,156	103,416	707,716	7.9	18.7	0.86	0.21	3.2	8¼–5	7.7
Ferro Corp.														
1987	$ 871,088	$ 31,687	$ 521,314	1.7	$ 171,889	$ 30,674	$ 240,039	3.6%	12.7%	$2.30	$0.67	2.7%	$ 31¼–17½	10.6
1986	725,241	24,082	443,801	1.9	153,712	23,162	217,750	3.3	11.1	1.77	0.60	3.4	20⅝–15⅛	10.1
1985	651,071	11,163[p]	391,133	2.0	145,651	26,451	193,850	1.7	5.6	0.83[p]	0.60	3.9	18½–12⅛	18.4
1984	662,867	16,886	359,938	2.0	136,462	29,364	185,983	2.5	9.1	1.27	0.60	4.0	19¼–11⅛	12.0
First Mississippi Corp.														
1987[q]	$ 278,946	$ 18,610	$ 276,638	1.8	$ 152,671	$ 19,527	$ 138,882	6.7%	13.4%	$0.93	$0.24	1.9%	$ 19⅛–6½	13.8
1986[q]	268,898	(28,110)[r]	287,562	1.6	155,266	31,635	125,521	—	—	(1.42)[r]	0.24	3.6	8⅛–5¼	—
1985[q]	273,185	18,239[s]	379,587	1.5	234,574	63,257	165,339	6.7	10.1	0.90[s]	0.24	2.6	11⅝–6⅜	10.1
1984[q]	270,004	15,845[t]	380,855	1.5	209,742	41,034	156,957	5.9	9.5	0.77[t]	0.24	2.3	13¾–7¼	13.6
GAF Corp.														
1987	$ 836,928	$ 100,052[u]	$ 1,241,482	2.6	$ 276,620	$ 65,911	$ 452,028	12.0%	22.1%	$2.53[u]	$0.10	0.2%	$ 60½–31⅜	17.3
1986	753,774	80,686[v]	1,341,325	3.9	208,396	33,914	595,754	10.7	13.5	2.22[v]	0.10	0.3	44–23⅞	15.3
1985	731,962	54,296[w]	879,174	1.7	194,086	47,161	298,153	7.4	18.2	1.57[w]	0.10	0.4	35–12⅛	15.0
1984	731,314	41,466[x]	452,273	2.2	159,115	17,900	214,006	5.7	19.3	1.31[x]	0.05	0.5	12⅞–7½	7.8

a Fiscal year ends Sept. 30. b Excludes extraordinary net charge on early retirement of indebtedness of $10.5 million ($0.38 per share). c Excludes extraordinary charge on early retirement of indebtedness of $2.0 million ($0.07 per share). d From continuing operations; excludes net loss from discontinued operations of $12.7 million ($0.39 per share) and provision for net loss on disposal of discontinued operations of $145.0 million ($4.53 per share). e From continuing operations; excludes net income and gain on sale of discontinued Vestal Laboratories operations of $30.0 million ($3.36 per share) and extraordinary gain on termination of pension plan of $811,000 ($0.09 per share). f From continuing operations; excludes net income and charge for discontinued Kem operations of $7.9 million ($1.24 per share). g Excludes net loss on early extinguishment of debt of $5 million ($0.03 per share). h Excludes net loss on early extinguishment of debt of $9 million ($0.05 per share). i Includes pretax gain on sales of investments of $183 million but excludes tax benefit from realization of foreign tax loss carry-forwards of $36 million ($0.19 per share). j Net loss. k From continuing operations; excludes net loss on discontinued operations of $13.3 million ($1.73 per share) and extraordinary loss on early retirement of debt of $556,000 ($0.07 per share). l From continuing operations; excludes net loss from discontinued coated products operations of $2.0 million ($0.26 per share). m Includes net charge for plant shutdown and write-off costs of $20.0 million. n Includes net nonrecurring charges of $25.2 million. o Excludes net loss on sale of Productol Chemical Division of $2.3 million ($0.17 per share). p Fiscal year ends June 30. q Excludes net gain from disposal of FirstMiss subsidiary of $900,000 ($0.04 per share). r Excludes net gain from disposal of FirstMiss subsidiary of $120,000 ($0.01 per share). s Excludes extraordinary credits of $137.5 million ($4.03 per share). t Excludes extraordinary credits of $212.5 million ($5.86 per share). u Excludes extraordinary credits of $23.3 million ($0.66 per share). v Excludes extraordinary credits of $15.7 million ($0.54 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
					(Money figures in thousands of dollars unless otherwise indicated)									
Georgia Gulf Corp.														
1987	$ 707,453	$ 91,736[a]	$ 308,609	1.7	$ 119,984	$ 9,931	$ 142,546	13.0%	64.4%	$ 6.29[a]	$0.40	0.9%	$ 69–19⅝	7.1
1986	583,255	39,123	264,632	2.0	119,116	7,428	77,956	6.7	50.2	2.41	0.00	0.0	20–19½	8.2
1985	613,537	36,431	292,142	1.1	135,007	6,177	36,289	5.9	100.4	2.21	0.00	—	—	—
1984[b]	610,345	19,494	506,735	—	—	—	—	3.2	—	—	—	—	—	—
B. F. Goodrich Co.														
1987	$2,186,000	$ 83,900[c]	$1,905,800	1.4	$ 898,200	$142,600	$ 972,600	3.9%	8.6%	$ 3.17[c]	$1.56	3.4%	$ 65–27⅜	14.6
1986	2,553,300	12,900[d]	1,786,700	1.4	865,200	144,000	799,200	0.5	1.6	0.48[d]	1.56	3.9	47⅞–32⅛	87.0
1985	3,200,500	(316,800)[e,f]	2,227,400	1.1	1,043,900	202,300	675,800	—	—	(14.11)[e,f]	1.56	5.0	35–25⅜	—
1984	3,340,800	60,600	2,544,000	1.5	1,307,400	153,200	1,065,800	1.8	5.7	2.52	1.56	5.1	36⅜–24⅜	12.1
W. R. Grace & Co.														
1987	$4,515,400	$141,900[g]	$4,361,500	1.4	$1,701,000	$242,500	$1,351,200	3.1%	10.5%	$ 1.67[g]	$1.40	5.0%	$ 37⅜–19⅛	16.9
1986	3,725,700	(375,400)[g,h]	3,993,000	1.3	1,579,000	199,100	1,204,400	—	—	(4.47)[g,h]	1.40	5.3	30⅜–22⅝	—
1985	5,193,000	127,800[i]	5,287,800	1.9	2,596,000	348,000	2,271,400	2.5	5.6	1.22[i]	1.40	6.6	24⅜–17⅞	17.3
1984	6,727,800	195,600	5,193,900	1.6	2,704,200	380,100	2,063,300	2.9	9.5	2.01	1.40	6.7	23½–18¼	10.4
Great Lakes Chemical Corp.														
1987	$ 478,386	$ 55,536	$ 523,365	1.8	$ 218,403	$ 35,186	$ 338,880	11.6%	16.4%	$ 3.34	$0.60	1.1%	$ 77–35⅞	16.9
1986	300,329	26,817	447,840	2.3	209,425	18,327	172,538	8.9	15.5	1.79	0.52	1.4	44½–30⅞	21.1
1985	276,932	28,818	314,423	2.2	137,710	21,344	186,718	10.4	15.4	1.93	0.44	1.2	44¼–31⅛	19.6
1984	278,235	35,568	276,469	2.2	130,784	28,770	164,805	12.8	21.6	2.38	0.36	1.1	38⅝–24	13.2
Hercules														
1987	$2,693,003	$208,000[j]	$3,492,077	3.6	$1,075,389	$205,037	$2,189,867	7.7%	9.5%	$ 4.02[j]	$1.84	3.2%	$ 73½–40	14.1
1986	2,615,110	206,200[k]	2,914,319	2.6	1,152,141	256,913	1,703,151	7.8	12.1	3.66[k]	1.72	3.5	60–37	13.3
1985	2,587,213	133,161[l]	2,658,822	2.5	1,000,212	234,240	1,474,201	5.1	9.0	2.40	1.60	4.5	40⅜–31⅛	15.0
1984	2,570,965	197,185	2,388,489	2.4	906,031	218,105	1,366,911	7.7	14.4	3.54	1.48	4.5	38–27¼	9.2
International Flavors & Fragrances														
1987	$ 745,861	$107,017	$ 874,554	4.2	$ 219,305	$ 36,946	$ 659,908	14.3%	16.2%	$ 2.85	$1.24	2.6%	$ 57⅜–37¼	16.8
1986	620,679	85,683	672,616	4.6	186,891	26,771	521,475	13.8	16.4	2.29	1.16	2.8	48⅞–34½	18.2
1985	501,046	69,698	559,855	4.2	159,298	22,134	426,986	13.9	16.3	1.89	1.12	3.4	40–26	17.5
1984	476,678	69,242	452,392	4.4	140,109	20,942	351,183	14.5	19.7	1.89	1.08	4.1	29¼–22⅞	13.8
International Minerals & Chemical Corp.														
1987[m]	$1,637,500	$ 14,600[n]	$2,242,400	1.4	$2,292,500	$ 62,500	$ 877,200	0.9%	1.7%	$ 0.08[n]	$1.00	2.5%	$ 53–26½	496.9
1986[m]	1,177,700	(79,600)[n,o]	2,225,200	2.2	2,170,700	93,900	792,400	—	—	(2.96)[n,o]	1.80	5.9	36¼–25	—
1985[m]	1,627,300	119,600	1,957,200	2.0	2,144,300	116,000	1,092,000	7.3	11.0%	4.39	2.60	6.6	44–34¼	8.9
1984[m]	1,532,900	112,000[p]	1,965,600	1.9	2,061,400	104,800	1,039,100	7.3	10.8	4.17[p]	2.60	6.4	49–32⅞	9.8
Lawter International														
1987	$ 112,018	$ 16,701	$ 109,917	4.3	$ 22,603	$ 1,528	$ 69,458	14.9%	24.0%	$ 0.71	$0.42	3.5%	$ 15⅝–8½	17.0
1986	103,515	12,945	93,392	3.7	22,447	1,613	55,191	12.5	23.5	0.56	0.42	3.9	13–8⅝	19.5
1985	96,769	(5,413)[q,r]	84,039	3.4	22,702	3,179	47,588	—	—	(0.23)[q,r]	0.42	4.7	10⅛–7⅜	—
1984	98,404	14,862	77,877	4.8	21,146	3,339	58,370	15.1	25.5	0.65	0.41	4.4	10⅞–7⅞	14.5
Liquid Air Corp.														
1987	$ 562,243	$ 36,822[s]	$ 718,809	1.2	$ 485,095	$ 72,173	$ 325,196	6.5%	11.3%	$ 2.59[s]	$1.60	5.7%	$ 36½–19½	10.8
1986	570,565	34,680	682,307	1.1	475,321	130,544	303,554	6.1	11.4	2.42	1.60	5.1	36½–25¾	12.9
1985	543,041	31,753	599,281	1.2	418,165	103,675	289,819	5.8	11.0	2.42	1.60	6.8	27⅜–19½	9.8
1984	501,735	27,304	549,821	1.8	370,530	62,461	246,667	5.4	11.1	2.07	1.60	7.7	23–18⅛	10.0
Loctite Corp.														
1987[m]	$ 337,802	$ 30,665	$ 299,367	1.9	$ 70,802	$ 15,470	$ 167,561	9.1%	18.3%	$ 1.69	$0.47	1.7%	$ 36–19	16.3
1986[m]	266,788	23,173	240,665	2.2	$ 57,711	9,299	150,163	8.7	15.4	1.28	0.41	2.0	24⅞–16⅝	16.2
1985[m]	231,479	20,443	215,482	1.9	49,793	11,278	121,918	8.8	16.8	1.12	0.40	2.5	18½–13½	14.3
1984[m]	241,744	26,349	223,694	2.0	45,696	6,172	129,526	10.9	20.3	1.33	0.32	1.7	21⅜–15¼	13.7
Lubrizol Corp.														
1987	$1,013,430	$ 81,335	$ 939,378	3.0	$ 297,573	$ 42,040	$ 621,633	8.0%	13.1%	$ 2.06	$1.22	3.6%	$ 41⅜–25¼	16.3
1986	976,778	78,185	877,907	2.7	289,078	40,460	572,679	8.0	13.7	1.97	1.17	3.9	35⅛–25⅝	15.4
1985	903,403	60,224	854,445	2.4	290,298	39,498	519,298	6.7	11.6	1.49	1.16	4.8	28⅞–19⅜	16.3
1984	831,681	67,731	701,974	2.8	251,735	29,490	474,343	8.1	14.3	1.73	1.12	5.2	24½–18¼	12.4
Monsanto Co.														
1987	$7,639,000	$436,000	$6,502,000	1.4	$3,076,000	$505,000	$1,948,000	5.7%	22.4%	$ 5.63	$2.75	3.5%	$100¼–57	14.0
1986	6,879,000	433,000	6,125,000	1.4	2,913,000	520,000	1,637,000	6.3	26.5	5.55	2.575	4.1	81½–44¾	11.4
1985	6,747,000	(128,000)[s,t]	6,678,000	1.1	3,034,000	645,000	1,208,000	—	—	(1.67)[s,t]	2.45	5.1	55⅝–40⅝	—
1984	6,691,000	439,000	6,250,000	2.0	3,374,000	614,000	3,511,000	6.6	12.5	5.42	2.25	4.8	53⅞–40⅝	11.5

a Excludes extraordinary net charge on early retirement of debt of $9.9 million ($0.68 per share). b Georgia Gulf became an independent corporation on Dec. 31, 1984, when it acquired a major portion of the assets of the chemical division of Georgia-Pacific Corp.; data for 1984 are for the latter. c From continuing operations; excludes net loss from discontinued operations of $4.7 million ($0.20 per share) and extraordinary net income of $25.8 million ($1.09 per share). d Excludes extraordinary net income of $19.8 million ($0.86 per share). e Net loss. f From continuing operations; excludes net loss from discontinued operations of $37.8 million ($1.68 per share). g From continuing operations; excludes net income from discontinued operations of $18.6 million ($0.22 per share) and tax benefit of operating loss carry-forward of $12.6 million ($0.14 per share). h From continuing operations; includes asset write-downs and reserves, before taxes, of $368.8 million but excludes net loss from discontinued operations of $96.9 million ($1.15 per share). i From continuing operations; excludes net income from discontinued retail operations of $19.1 million ($0.18 per share). j Excludes net gain on disposal of Himont and other net gains and charges of $613.7 million ($10.72 per share). k Excludes nonrecurring net gains from sale of investments and businesses and nonrecurring net costs of $20.5 million ($0.36 per share). l Includes pretax gain on disposal of assets of $16.4 million. m Fiscal year ends June 30. n From continuing operations; excludes net income on disposal of discontinued operations of $11.3 million ($0.41 per share) and extraordinary net charge of $4.8 million ($0.18 per share). o From continuing operations; excludes net loss from and net provision for loss on disposal of discontinued gas and oil and industrial products operations of $137.4 million ($5.08 per share). p Excludes net loss from operation and disposal of discontinued methanol joint venture of $30.3 million ($1.13 per share). q Includes one-time tax provision for future repatriation of foreign earnings of $14.0 million ($0.60 per share). r From continuing operations; excludes net loss from discontinued diving equipment operations of $224,000 ($0.02 per share). s Includes special charge for restructuring costs, before taxes, of $557 million but excludes net gain from repayment of debt of $30 million ($0.40 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
					(Money figures in thousands of dollars unless otherwise indicated)									
Morton Thiokol														
1987[a]	$1,987,300	$138,000	$ 1,426,400	1.5	$ 655,900	$130,400	$ 700,400	6.9%	19.7%	$2.90	$0.745	1.7%	$54⅜–31	14.8
1986[a]	1,949,900	132,900	1,225,000	1.7	593,900	95,700	629,900	6.8	21.1	2.80	0.685	1.9	42½–30	12.9
1985[a]	1,832,300	119,500[b]	1,173,900	1.8	560,700	117,000	510,500	6.5	23.4	2.44[b]	0.63	1.9	40½–26	13.6
1984[a]	2,001,508	109,759	1,152,082	1.5	526,713	90,859	489,545	5.5	22.4	2.17	0.57	2.2	31½–20	11.9
Nalco Chemical Co.														
1987	$ 841,876	$ 80,254	$ 696,360	1.7	$ 304,084	$ 57,232	$ 396,297	9.5%	20.3%	$2.03	$1.20	3.5%	$45½–24	17.1
1986	736,074	63,672	536,916	1.7	280,195	53,635	358,023	8.7	17.8	1.62	1.20	4.4	31⅛–23½	16.9
1985	682,333	73,332	492,998	1.8	247,912	59,905	335,585	10.7	21.8	1.87	1.20	4.8	28⅜–22	13.5
1984	664,303	73,086[c]	471,543	2.4	205,103	52,478	344,392	11.0	21.2	1.86[c]	1.20	4.4	33¼–21	14.6
Olin Corp.														
1987	$1,930,000	$ 78,000	$ 1,583,000	1.7	$ 727,000	$115,000	$ 598,000	4.0%	13.0%	$3.38	$1.60	3.6%	$56¼–32⅝	13.1
1986	1,707,261	75,226	1,464,830	1.5	719,686	127,935	574,290	4.4	13.1	3.36	1.525	3.5	53¼–34⅜	13.1
1985	1,751,106	(190,308)[d,e]	1,516,096	1.6	718,371	154,499	604,844	—	—	(8.28)[d,e]	1.50	4.5	38–28⅜	—
1984	2,065,328	88,747	1,822,099	1.9	860,658	165,000	867,307	4.3	10.2	3.81	1.365	4.7	33½–25⅛	7.7
Pennwalt Corp.														
1987	$1,142,750	$ 53,803[f]	$ 993,626	1.9	$ 432,029	$ 54,877	$ 427,110	4.7%	12.6%	$4.12	$2.25	4.4%	$68¼–34⅜	12.5
1986	1,107,564	51,947	962,252	2.1	436,282	54,379	465,369	4.7	11.2	3.64	2.20	4.4	59–40⅜	13.7
1985	1,013,308	11,216[g]	937,672	1.5	433,867	89,691	445,020	1.1	2.5	0.05[g]	2.20	5.6	44½–34	785.0
1984	1,047,214	45,356	868,673	1.9	393,765	87,177	485,325	4.3	9.3	3.31	2.20	6.0	42¼–31½	11.1
Quantum Chemical Corp.														
1987	$2,566,800	$143,600[h]	$ 2,519,300	1.3	$1,380,200	$154,200	$ 983,500	5.6%	14.6%	$4.38[h]	$2.20	3.4%	$ 88–42½	14.9
1986	1,729,600	55,100[i]	2,844,200	1.0	1,393,800	101,600	944,500	3.2	5.8	1.54[i]	2.20	5.7	47⅝–30	25.3
1985	2,289,000	77,000[j]	1,948,000	1.5	899,300	76,200	930,300	3.4	8.3	2.27[j]	2.20	7.2	37½–23⅝	13.5
1984	2,244,900	69,900[k]	1,828,800	1.9	747,700	116,100	943,500	3.1	7.4	2.01[k]	2.20	8.3	30–22⅝	13.1
Rohm & Haas Co.														
1987	$2,203,000	$195,000[l]	$ 1,882,000	1.9	$ 730,000	$222,000	$ 981,000	8.9%	19.9%	$2.85[l]	$0.86	2.2%	$53¼–24	13.6
1986	2,067,000	138,000[m]	1,756,000	2.0	648,000	179,000	916,000	6.7	15.1	2.01[m]	0.78	2.5	38⅛–23⅞	15.6
1985	2,051,000	141,000[n]	1,655,000	2.0	581,000	159,000	857,000	6.9	16.5	2.01[n]	0.70	3.1	26⅛–18⅝	11.1
1984	2,042,011	172,219[o]	1,540,570	2.0	555,945	134,253	872,687	8.4	19.7	2.24[o]	0.60	3.1	23⅛–16	8.7
Sigma-Aldrich Corp.														
1987	$ 304,858	$ 41,889	$ 285,343	2.9	$ 96,975	$ 20,616	$ 196,012	13.7%	21.4%	$1.70	$0.29	0.7%	$50⅝–30¼	23.8
1986	253,097	33,958	244,875	2.5	86,111	35,461	155,689	13.4	21.8	1.38	0.25	0.7	40¼–26⅜	24.3
1985	214,848	28,855	186,552	3.4	57,771	17,386	126,306	13.4	22.9	1.13	0.21	0.9	28⅜–17⅛	20.1
1984	179,529	24,220	174,144	5.4	46,037	11,852	129,932	13.5	18.6	0.93	0.175	1.1	17⅛–14⅜	16.9
Stepan Co.														
1987	$ 288,935	$ 10,959	$ 172,726	1.6	$ 98,994	$ 25,705	$ 59,936	3.8%	18.3%	$3.67	$0.83	2.0%	$53½–29	11.2
1986	259,787	7,513	152,794	1.5	85,607	14,322	55,029	2.9	13.6	2.53	0.74	2.6	35⅜–20⅜	11.3
1985	235,919	5,471	139,307	1.5	82,796	19,189	49,575	2.3	11.0	1.89	0.69	3.5	23¼–16⅜	10.5
1984	234,930	5,423[p]	133,941	1.6	73,261	11,557	47,660	2.3	11.4	1.66[p]	0.65	3.9	18⅝–14½	10.0
Union Carbide Corp.														
1987	$6,914,000	$232,000	$ 7,820,000	1.3	$4,344,000	$502,000	$1,175,000	3.4%	19.7%	$1.76	$1.50	6.2%	$32½–15½	13.6
1986	6,244,000	130,000[q]	7,496,000	1.2	4,379,000	524,000	930,000	2.1	14.0	1.25[q]	1.50	5.8	33⅛–18⅜	20.8
1985[r]	6,596,000	(38,000)[d]	8,461,000	1.3	4,927,000	649,000	519,000	—	—	(0.38)[d]	1.13	6.1	24¾–12	—
1984	9,508,000	341,000[s]	10,402,000	1.8	6,383,000	670,000	4,806,000	3.6	7.1	1.61[s]	1.13	6.9	21⅞–16⅞	10.1
Vista Chemical Corp.														
1987[t]	$ 608,887	$ (1,762)[u]	$ 474,265	1.5	$ 266,250	$ 20,889	$ 134,686	—	—	($0.13)[u]	$0.05	0.1%	$55⅛–18⅝	—
1986[t]	550,097	30,212[v]	453,418	1.8	272,699	15,792	60,808	5.5%	49.7%	1.73[v]	0.00	0.0	18¾–17	10.3
1985[t]	521,313	11,917	454,688	1.9	282,946	10,284	23,281	2.3	51.2	0.68	0.00	0.0	—	—
1984[t,w]	101,122	2,006	536,102	—	—	1,596	—	2.0	—	0.12	0.00	0.0	—	—
Witco Corp.														
1987	$1,427,650	$ 63,293	$ 1,037,624	3.0	$ 374,628	$ 69,082	$ 494,941	4.4%	12.8%	$2.72	$1.16	3.1%	$47⅞–26⅝	13.6
1986	1,355,018	65,215	804,086	2.4	367,789	50,102	449,783	4.8	14.5	2.93	1.05	3.2	40–26⅜	11.3
1985	1,448,929	56,774	794,368	2.3	360,950	71,093	399,486	3.9	14.2	2.57	0.99	4.0	27¾–22	9.7
1984	1,495,831	62,602	739,488	2.2	348,740	65,720	358,497	4.2	17.5	2.85	0.93	4.2	26⅝–18⅜	7.8

a Fiscal year ends June 30. b From continuing operations; excludes net income from discontinued Texsize Division operations of $3.3 million ($0.06 per share) and net gain on sale of the division of $75.1 million ($1.51 per share). c Excludes net income from discontinued lead antiknock compounds operations of $3.1 million ($0.08 per share). d Net loss. e From continuing operations; includes special charge for restructuring costs, before taxes, of $330.0 million but excludes net income and net gain on sale of Ecusta paper and film businesses of $25.0 million ($1.09 per share). f From continuing operations; excludes net income from discontinued equipment operations of $1.4 million ($0.10 per share). g From continuing operations; includes special charge for restructuring program, before taxes, of $38.6 million but excludes net loss from operations and on disposal of discontinued dental businesses of $30.9 million ($2.80 per share). h From continuing operations; excludes net income from discontinued spirits and wine operations of $108.0 million ($3.37 per share). i From continuing operations; excludes net income from discontinued spirits and wine operations of $20.5 million ($0.67 per share). j From continuing operations; excludes net income from discontinued insurance business of $200,000 ($0.01 per share). k From continuing operations; excludes net loss from discontinued metals and petroleum operations of $18.5 million ($0.60 per share). l Includes net gain on sales of assets of $5.0 million ($0.07 per share). m Includes net loss on disposal of assets of $9.2 million ($0.13 per share). n Includes net gain on disposal of assets of $4.6 million ($0.07 per share). o Includes net loss on sale of oil and gas properties of $3.6 million ($0.05 per share). p Includes nonrecurring net loss on write-down of equipment of $2.6 million. q From continuing operations; excludes net income and net gain on disposal of discontinued operations of $569 million ($5.49 per share) and net charges for extraordinary items of $203 million ($1.96 per share). r Pro forma, after adjustment for repurchase of common stock, sale of consumer products businesses, special charges for restructuring program, and other special gains and losses. s Excludes extraordinary charge related to accident in Bhopal, India, of $18 million ($0.08 per share). t Fiscal year ends Sept. 30. u Includes net charge associated with change in stock option plan of $55.4 million and net gain on sale of interest in Petroquimica Argentina of $5.1 million but excludes net loss on extinguishment of debt of $1.9 million ($0.12 per share). v From start of operations July 20. w From continuing operations; excludes net income from operations and net gain on sale of discontinued businesses of $76.3 million ($0.50 per share).

Year	Net sales	Net income	Total assets	Current ratio	Net plant and equipment	Capital expenditures	Net worth	NET INCOME % of sales	NET INCOME % of net worth	NET INCOME $ per share	Dividends, $ per share	Dividend yield, % of price	Stock price range, $ per share	Price-earnings ratio
					(Money figures in thousands of dollars unless otherwise indicated)									
PHARMACEUTICALS														
Abbott Laboratories														
1987	$4,387,876	$632,559	$4,385,737	1.3	$1,741,557	$432,700	$2,093,453	14.4%	30.2%	$2.78	$1.00	1.9%	$ 67–40	19.3
1986	3,807,634	540,460	3,865,609	1.3	1,543,267	383,400	1,778,921	14.2	30.4	2.32	0.84	1.9	55–31⅝	18.7
1985	3,360,273	465,335	3,468,373	1.9	1,368,542	292,900	1,670,663	13.8	24.9	1.94	0.70	2.5	36–19⅞	14.4
1984	3,103,962	402,575	3,172,897	1.7	1,236,572	334,800	1,602,700	13.0	25.1	1.67	0.60	2.8	24⅜–18⅜	12.8
American Home Products Corp.														
1987	$5,028,272	$845,081	$3,956,855	2.0	$1,153,028	$278,525	$1,878,178	16.8%	45.0%	$5.73	$3.34	4.2%	$ 96¾–62	13.9
1986	4,926,512	778,824[a]	3,819,146	2.7	929,400	204,764	2,024,869	15.8	38.5	5.18[a]	3.10	4.0	94⅞–61¼	15.1
1985	4,684,742	717,140	3,201,746	3.3	859,414	179,347	2,098,293	15.3	34.2	4.70	2.90	5.0	66⅞–50⅛	12.4
1984	4,485,470	655,828[b]	2,849,732	3.3	769,623	141,891	1,905,733	14.6	34.4	4.26[b]	2.64	5.2	55¾–46¾	12.0
Bristol-Myers Co.														
1987	$5,401,200	$709,600[c]	$4,549,400	2.8	$1,141,900	$190,000	$3,046,700	13.1%	23.3%	$2.47[c]	$1.40	3.3%	$ 55¾–28¼	17.0
1986	4,835,900	589,500	3,993,900	2.5	1,070,000	221,900	2,646,500	12.2	22.3	2.07	1.06	2.9	44¼–30½	18.0
1985	4,444,000	531,400	3,557,300	2.3	925,800	222,000	2,287,100	12.0	23.2	1.83	0.905	3.1	34¼–24½	15.2
1984	4,189,400	472,400	3,100,800	2.4	791,100	191,600	1,998,100	11.3	23.6	1.72	0.75	3.2	26⅛–20½	13.6
Eli Lilly & Co.														
1987	$3,643,800[d]	$410,500	$4,859,200	1.8	$1,642,500	$344,100	$2,646,900	11.3%	15.5%	$2.83[d]	$2.00	2.4%	$107⅞–57⅜	29.2
1986	3,720,400	558,200	4,117,000	1.7	1,527,600	283,000	2,260,800	15.0	24.7	4.01	1.80	2.7	83½–50⅝	16.7
1985	3,270,600	517,600	3,859,400	1.7	1,374,000	207,100	2,293,400	15.8	22.6	3.69	1.60	3.6	55⅞–32¼	11.9
1984	3,109,200	490,200	3,556,500	1.6	1,280,400	205,300	2,133,800	15.8	23.0	3.36	1.49	4.9	33¾–26½	9.9
Merck & Co.														
1987	$5,061,300	$906,400	$5,533,200	1.3	$1,948,000	$253,700	$1,969,900	17.9%	46.0%	$2.23	$0.82	1.4%	$ 74¼–40⅝	25.8
1986	4,128,900	675,700	4,967,900	1.7	1,906,200	210,600	2,431,800	16.4	27.8	1.62	0.63	1.9	43⅛–22⅜	20.3
1985	3,547,500	539,900	4,805,100	1.9	1,882,800	237,600	2,536,900	15.2	21.3	1.26	0.53	2.8	23–15	15.0
1984	3,559,665	492,967	4,489,697	1.9	1,912,778	274,425	2,443,260	13.8	20.2	1.12	0.50	3.4	16¼–13	13.1
Pfizer														
1987	$4,919,800	$690,200	$6,684,700	2.0	$1,505,900	$258,300	$3,644,500	14.0%	18.9%	$4.08	$1.80	3.1%	$ 77–40	14.3
1986	4,475,000	660,000	4,946,700	1.9	1,351,300	196,100	3,198,200	14.7	20.6	3.90	1.64	2.8	72⅞–46¼	15.3
1985	4,024,500	579,700	4,341,500	2.1	1,268,300	195,800	2,805,900	14.4	20.7	3.44	1.48	3.2	56¼–37⅝	13.6
1984	3,854,500	507,900	3,927,700	2.1	1,155,600	144,000	2,365,100	13.2	21.5	3.08	1.32	3.7	42⅜–29⅜	11.6
Schering-Plough Corp.														
1987	$2,699,300	$320,700[e]	$3,053,200	1.2	$1,131,100	$118,000	$1,317,36	11.9%	24.3%	$2.77[e]	$1.025	2.4%	$ 55¼–31¼	15.6
1986	2,398,700	265,800	2,862,000	1.3	1,143,500	124,800	1,319,70	11.1	20.1	2.17	0.90	2.5	44–28	16.6
1985	1,927,100	192,600	2,683,800	1.4	991,800	140,300	1,389,600	10.0	13.9	1.68	0.84	3.3	33⅛–17⅞	13.5
1984	1,874,300	177,200	2,436,200	1.2	912,400	173,700	1,235,100	9.5	14.3	1.75	0.84	4.6	20–16½	10.4
SmithKline Beckman Corp.														
1987	$4,328,800	$570,100	$4,005,600	1.2	$1,480,200	$224,000	$1,144,000	13.2%	49.8%	$4.50	$1.62	2.9%	$ 72¾–39⅛	12.5
1986	3,745,400	521,100	3,891,400	1.3	1,410,800	237,000	965,400	13.9	54.0	3.39	1.50	3.4	52⅝–36⅛	13.2
1985	3,256,600	514,400	3,534,500	1.8	1,285,300	248,000	2,070,100	15.8	24.8	3.28	1.425	4.3	39⅝–26⅛	10.1
1984	2,949,200	500,300[f]	3,077,600	2.0	1,093,000	241,500	1,952,100	17.0	25.6	3.10[f]	1.40	5.1	30⅛–25	8.9
Squibb Corp.														
1987	$2,156,503	$358,441	$2,782,375	1.5	$ 784,841	$166,539	$1,525,451	16.6%	23.5%	$3.42	$1.20	1.5%	$102⅞–55¼	23.1
1986	1,784,629	263,639[g]	2,408,831	1.8	645,630	95,077	1,358,096	14.8	19.4	2.45[g]	0.97	1.9	62–38⅛	20.4
1985	2,041,745	226,599	2,396,592	2.0	701,439	120,342	1,409,382	11.1	16.1	2.10	0.86	2.6	41⅛–24⅞	15.7
1984	1,886,037	197,172	2,072,188	2.1	617,724	115,629	1,266,517	10.5	15.6	1.84	0.74	3.2	27⅛–18¾	12.5
Upjohn Co.														
1987	$2,521,024	$305,039	$3,043,131	1.9	$1,114,391	$211,976	$1,673,512	12.1%	18.2%	$1.63	$0.63	1.6%	$ 53⅜–23¼	23.6
1986	2,280,325	252,646	2,664,956	1.9	981,549	201,920	1,470,216	11.1	17.2	1.35	0.51	1.8	35½–20½	20.7
1985	2,008,486	203,193[h]	2,376,873	1.8	852,054	152,637	1,295,085	10.1	15.7	1.10[h]	0.45	2.6	23⅝–11⅛	15.8
1984	2,179,060	173,272	2,248,363	1.5	809,534	136,738	1,134,154	8.0	15.3	0.94	0.43	4.4	12–7½	10.3
Warner-Lambert Co.														
1987	$3,484,700	$295,800	$2,396,500	1.1	$ 959,800	$176,900	$ 795,000	8.5%	37.2%	$4.15	$1.77	2.6%	$ 87½–48¼	16.4
1986	3,102,918	261,784[i]	2,479,054	1.4	819,291	137,996	870,453	8.4	30.1	3.54[i]	1.59	2.9	63⅛–45	15.3
1985	3,200,069	237,704[j]	2,286,187	1.2	868,931	138,774	819,279	7.4	29.0	3.05[j]	1.56	3.2	49⅜–33⅜	13.6
1984	3,166,657	223,887	2,377,098	1.5	863,179	142,461	910,125	7.1	24.6	2.81	1.48	4.6	36⅛–28⅝	11.5

a Includes gain on sale of Brach confectionary business and Household Research subsidiary, before taxes, of $535 million. b From continuing operations; excludes net income from operations and net gain on sale of discontinued businesses of $76.3 million ($0.50 per share). c Includes gain on sale of orthodontic and animal health businesses, before taxes, of $80.3 million. d From continuing operations; includes restructuring charges, before taxes, of $271.9 million but excludes net income and net gain on sale of discontinued cosmetics business of $233.2 million ($1.58 per share). e Excludes nonrecurring net charge of $4.3 million ($0.04 per share). f Excludes net gain on sale of Industrial Business Group of $3.3 million ($0.02 per share). g From continuing operations; excludes net income from discontinued operations of $13.1 million ($0.12 per share), net gain on disposal of discontinued operations of $187.6 million ($1.75 per share), and extraordinary net charge for write-off of certain foreign assets of $66.0 million ($0.63 per share). h From continuing operations; excludes net loss from operations and sale of polymer chemical business of $238,000. i Excludes net nonrecurring credit from write-down and divestiture of assets and restructuring program of $47.7 million ($0.64 per share). j Excludes net nonrecurring charge for write-down and divestiture of assets and restructuring program of $553.3 million ($7.10 per share).

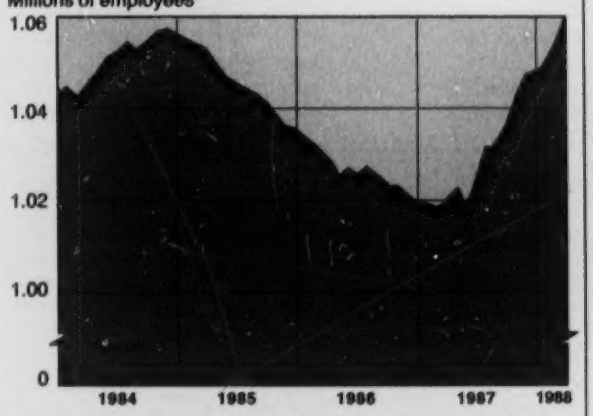
Chemical work force edges higher

Overall employment in the U.S. chemical industry reversed a two-year decline begun in 1984. The increase—less than 1%—was slight, however, and the total work force in 1987 was still 4% below what it was a decade earlier. The number of workers rose the most in the drug and soap, cleaners, and toilet goods sectors, but it continued to fall or remained almost steady in most other sectors. The largest decline occurred in industrial organic chemicals, employment in which fell about 2% to a level 8% below what it was 10 years ago.

Major chemical firms again reduced their ranks of employees, but only 5% rather than the deep cut of 24% seen in 1986. Those companies that hired more workers did so in relatively small increments, however.

Total employment of scientists and engineers in the chemical industry, however, witnessed an unusual reversal of the nearly steady rise that has been going on for more than a decade. As a group, scientists until last year had been much more immune to substantial cuts than other chemical workers.

Number of workers in chemical industry rebounds to level of late 1984



a Seasonally adjusted employment in U.S. chemicals and allied products industry; March and April 1988 figures are preliminary. **Source:** Department of Labor

INDUSTRIAL EMPLOYMENT: Slightly lower for industrial chemicals last year

	All employees[a] (thousands)				Production workers[a] (thousands)				Workweek[a,b] (hours)			
	1987	1986	1985	1977	1987	1986	1985	1977	1987	1986	1985	1977
All manufacturing	19,112	18,994	19,260	19,682	13,021	12,895	13,092	14,135	41.0	40.7	40.5	40.3
Chemicals and allied products	1,026	1,023	1,044	1,073	575	568	578	616	42.3	41.9	41.9	41.7
Industrial inorganic chemicals	134	136	142	162	68	70	72	95	42.6	42.0	41.7	41.9
Plastics materials and synthetics	166	167	172	215	109	113	114	142	43.1	42.1	42.3	43.4
Drugs	212	207	206	181	97	96	95	90	41.5	41.6	41.1	41.0
Soap, cleaners, and toilet goods	153	147	148	130	97	93	94	78	41.1	41.0	41.0	40.7
Paints and allied products	63	63	64	66	31	31	31	35	41.7	41.6	41.4	41.2
Industrial organic chemicals	152	155	160	166	86	82	82	84	44.1	43.4	43.3	42.7
Agricultural chemicals	54	55	59	68	34	34	37	42	42.8	42.2	42.7	43.0
Miscellaneous chemical products	94	93	94	87	53	52	54	50	41.4	41.3	41.9	41.8
Petroleum and coal products	165	169	179	202	108	106	109	131	43.9	43.8	43.0	42.7
Rubber and miscellaneous plastics products	818	790	786	714	636	614	607	558	41.6	41.3	41.1	41.0

a Domestic employment. b Workweek of production or nonsupervisory workers. **Source:** Department of Labor

EMPLOYMENT OF SCIENTISTS, ENGINEERS: Increases by chemical producers were modest

Thousands[a]	1987[b]	1986[b]	1985	1984	1983	1982	1981	1980	1979	1978	1977
Total, all industry	610.0	580.3	560.2	544.5	522.1	509.8	487.8	450.6	423.9	404.4	382.8
Chemicals and allied products	66.2	70.0	67.0	67.1	66.0	61.6	54.7	51.4	50.0	48.3	46.4
Industrial chemicals	27.1	27.1	25.0	26.7	27.2	25.9	21.6	20.9	21.4	21.3	20.6
Drugs and medicines	29.0[c]	31.6[c]	30.7[c]	30.1[c]	28.2	25.6	23.3	21.6	20.8	19.5	17.8
Other chemicals	10.1	11.3	11.3	10.3	10.6	10.1	9.8	8.9	7.8	7.5	8.0
Petroleum refining	8.5	10.3	13.4	13.2	14.7	15.6	13.0	10.8	10.1	9.9	8.9
Rubber products	12.5	13.0	13.0	na	na	8.1	10.3	na	8.1	7.9	9.1

a Full-time equivalent number of R&D scientists and engineers in industry, as of January of each year. b Preliminary. c Partly estimated. na = not available separately, but included in total. **Source:** National Science Foundation

CHEMICAL EMPLOYMENT: Declined further in 1987, leading sales per employee to improve

Thousands	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
Air Products	12.1	16.6	18.7	17.7	16.7	18.9	16.2	15.8	14.6	14.3	13.7
American Cyanamid	34.3	34.5	36.4	38.2	38.7	40.2	41.8	42.6	44.2	44.0	43.8
Betz Laboratories	2.0	2.6	2.5	2.5	2.3	2.2	2.2	2.1	2.0	1.8	1.6
Cabot Corp.	5.1	6.6	7.7	7.5	7.2	7.5	7.7	7.6	8.1	7.9	5.6
Chemed	4.8	4.8	4.3	4.3	4.1	3.5	3.6	3.6	3.3	3.1	3.0
Crompton & Knowles	1.3	1.3	2.3	2.3	2.4	2.3	2.5	2.8	3.0	3.2	3.1
Dow Chemical	53.1	51.3	53.2	49.8	54.5	56.6	63.8	56.8	55.9	53.5	53.2
Ethyl	10.0	10.5	10.5	11.0	13.0	14.0	14.5	15.0	16.0	16.5	16.0
H. B. Fuller	4.6	4.5	4.4	4.3	4.1	4.0	3.3	3.4	3.4	3.3	3.0
W. R. Grace	39.4	41.4	116.9	102.6	95.5	82.2	89.0	92.0	82.8	69.1	69.1
Hercules	23.2	25.1	25.4	26.3	24.2	24.5	25.9	26.1	27.4	27.1	26.3
International Flavors	4.1	3.8	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.5	3.3
International Minerals	12.9	13.9	8.7	9.0	8.4	8.4	10.6	10.6	10.3	9.9	9.9
Lubrizol	4.8	4.8	5.2	4.2	4.2	4.3	4.2	4.2	3.9	3.8	3.6
Monsanto	49.7	51.7	56.1	50.8	48.8	52.2	57.4	61.8	63.9	62.9	61.5
Nalco Chemical	5.1	4.9	5.1	4.8	4.6	4.6	4.7	4.3	4.1	4.1	4.2
Olin	14.1	13.2	14.9	17.8	18.2	17.5	20.3	21.0	21.7	22.7	22.4
Pennwalt	9.0	9.6	9.9	9.8	9.8	9.5	10.7	12.8	13.3	14.0	13.9
PPG Industries	36.8	36.5	37.5	37.7	37.0	37.0	36.6	37.3	38.2	37.4	36.6
Rohm & Haas	12.0	12.1	11.8	11.9	11.4	11.5	13.5	13.2	13.3	13.1	13.0
Stepan	1.0	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.8	0.8
Union Carbide	43.1	50.3	91.5	98.4	99.5	103.2	110.3	116.1	115.8	113.4	113.7
TOTAL EMPLOYEES	**382.6**	**400.9**	**527.6**	**515.5**	**509.1**	**508.6**	**543.3**	**553.4**	**549.7**	**529.5**	**521.4**
ANNUAL CHANGE	**−4.6%**	**−24.0%**	**2.4%**	**1.2%**	**0.1%**	**−6.4%**	**−1.8%**	**0.7%**	**3.8%**	**1.6%**	**2.4%**
SALES PER EMPLOYEE ($ thousands, current)	**$159.9**	**$135.3**	**$114.4**	**$115.5**	**$110.0**	**$107.7**	**$109.3**	**$101.8**	**$ 92.6**	**$ 79.7**	**$ 73.0**
SALES PER EMPLOYEE ($ thousands, constant 1982[a])	**$150.3**	**$132.0**	**$110.3**	**$112.3**	**$109.8**	**$107.7**	**$111.0**	**$114.3**	**$121.6**	**$117.1**	**$110.7**

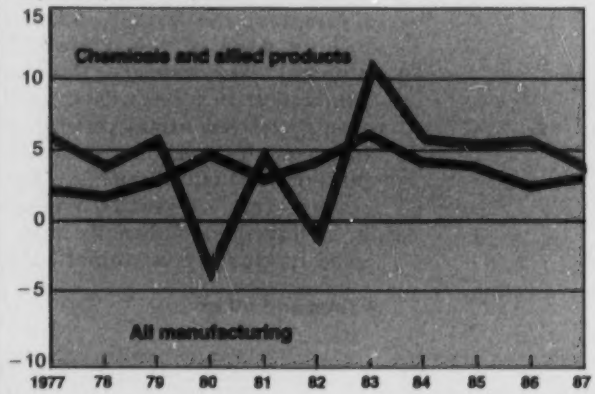
Note: Data are not restated for acquisitions, divestitures, or similar developments. a Based on producer price index for chemicals and allied products.

WAGES: Steady rise of recent years continued for chemical workers

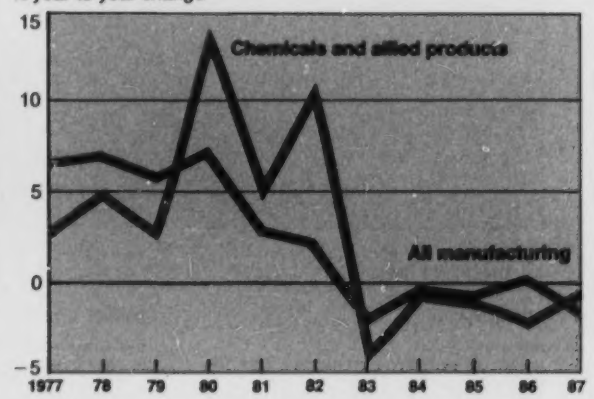
	Hourly earnings[a]				Weekly earnings[a]			
	1987	1986	1985	1977	1987	1986	1985	1977
All manufacturing	$ 9.91	$ 9.73	$ 9.54	$5.68	$406.31	$396.01	$386.37	$228.90
Chemicals and allied products	12.37	11.98	11.56	6.43	523.25	501.96	484.36	268.13
Industrial inorganic chemicals	13.62	13.12	12.80	6.99	580.21	551.04	533.76	292.88
Plastics materials and synthetics	12.52	12.12	11.71	6.29	539.61	510.25	495.33	262.92
Drugs	11.64	11.16	10.75	5.99	483.06	464.26	441.83	245.59
Soap, cleaners, and toilet goods	10.87	10.73	10.28	6.13	446.76	439.93	421.07	249.49
Paints and allied products	10.82	10.43	10.08	5.91	451.19	433.89	417.31	243.49
Industrial organic chemicals	14.88	14.39	13.98	7.42	656.21	624.53	605.33	316.83
Agricultural chemicals	11.98	11.46	11.03	6.03	512.74	483.61	470.98	259.29
Miscellaneous chemical products	11.38	11.08	10.61	6.02	471.13	457.60	444.56	251.64
Petroleum and coal products	14.57	14.18	14.06	7.83	639.62	621.08	604.58	334.34
Rubber and miscellaneous plastics products	8.88	8.73	8.54	5.17	369.41	360.55	350.99	211.97

a For production and nonsupervisory workers in domestic employment. **Source:** Department of Labor

Productivity growth slowed for chemicals . . .



. . . so that unit labor costs fell only slightly



Note: Productivity is output per workhour, calculated by dividing indexes for production by indexes for workhours of production employees. Unit labor costs are labor costs per unit of output, calculated by dividing indexes for wages by indexes for output per workhour. **Sources:** Federal Reserve Board, Department of Labor, C&EN estimates

The U.S. chemical industry continued to become more productive for the fifth straight year in 1987. But the growth of productivity slowed considerably from that during the four previous years.

Productivity in the U.S. chemical industry rose last year as production increased 5.3%, outstripping the 1.4% rise for workhours. This is in contrast to the previous two years, when workhours in the industry were falling as output was rising.

Using data from government agencies, C&EN figures that chemical industry productivity (output per workhour) rose 3.9% in 1987. This compares with a 3.6% rise for all manufacturing industries, narrowing the gap between the two. In 1986, productivity growth for chemicals and allied products was 5.5%, compared with only 2.5% for all manufacturing. For 1987, production for all manufacturing increased 4.2% and workhours rose 0.6%.

The pattern for unit labor costs (labor costs per unit of output) was essentially the same as that for productivity. Hourly production wages rose 3.4% for all chemicals but increased a much lower 1.9% for all manufacturing. As a result, the decrease in unit labor costs for chemicals was less than that for all manufacturing for the first time in the past five years.

Unit labor costs for chemicals fell only 0.5% in 1987 from the year-earlier level, whereas the same index for all manufacturing fell 1.6%. In 1986, chemical unit labor costs declined 2.0% while unit labor costs for all manufacturing rose a slight 0.1%.

PRODUCTIVITY: Gains persisted as output climbed while workhours were little changed

Indexes, 1977 = 100	1987	1986	1985	1984	1983	1982	1981	1980	1979	1978	1977
CHEMICALS AND ALLIED PRODUCTS											
Production	140.0	133.0	127.1	121.6	113.9	103.8	112.6	106.4	113.3	106.3	100.0
Workhours	94.8	93.5	94.3	95.0	93.9	95.2	101.7	101.0	103.1	102.2	100.0
Productivity	147.7	142.2	134.8	128.0	121.3	109.0	110.7	105.4	109.9	104.0	100.0
Hourly production wages	192.4	186.1	180.1	172.7	164.8	155.0	141.8	129.2	118.2	109.2	100.0
Unit labor costs	130.3	130.9	133.7	135.0	135.9	142.2	128.2	122.6	107.6	105.0	100.0
ALL MANUFACTURING											
Production	134.6	129.2	126.4	123.4	113.9	102.2	110.5	108.2	110.7	106.1	100.0
Workhours	93.6	93.0	93.3	94.8	88.2	87.0	97.9	96.9	106.4	104.5	100.0
Productivity	143.8	138.8	135.5	130.1	124.8	117.5	112.9	109.4	104.2	101.5	100.0
Hourly production wages	174.4	171.1	166.9	161.5	155.4	149.6	140.7	128.1	118.0	108.6	100.0
Unit labor costs	121.6	123.3	123.2	124.1	124.4	127.3	124.7	121.5	113.2	107.0	100.0

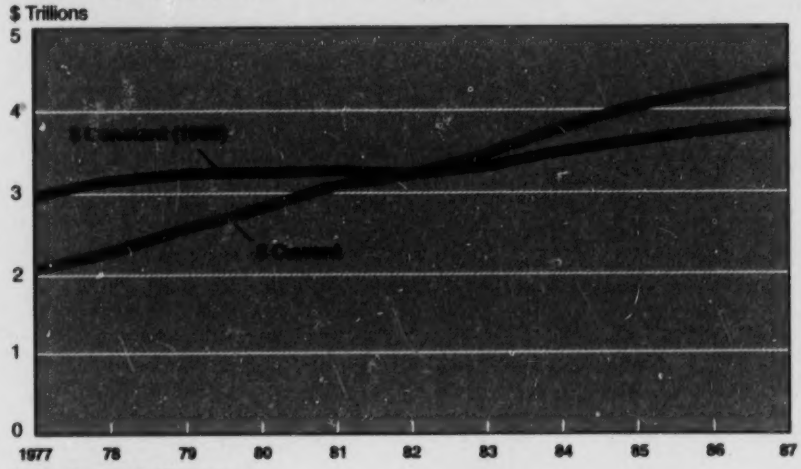
Sources: Federal Reserve Board, Department of Labor, C&EN estimates

4 Markets for the U.S. Chemical Industry

No industry can long outperform its best customers. These two pages present a series of graphical snapshots depicting recent trends among some of the most significant consumers of chemicals.

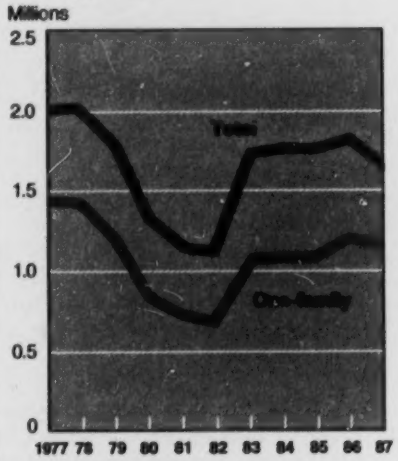
Because its products are so diverse and their uses so broad, the U.S. chemical industry finds markets throughout the varied and interlocking parts of the overall U.S. economy. The industry, therefore, has reaped rich rewards from the steady and restrained growth that the economy has undergone since pulling itself out of the 1981–82 recession. The five-year recovery has been largely fueled, moreover, by steadily growing consumer spend-

Gross national product



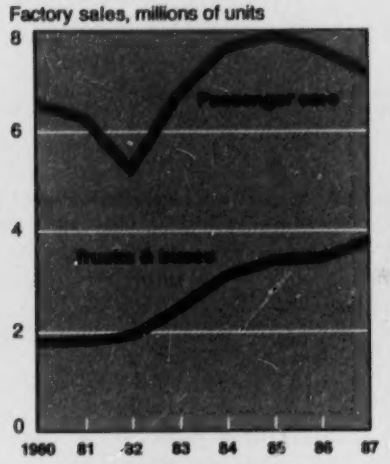
Source: Department of Commerce

Housing starts



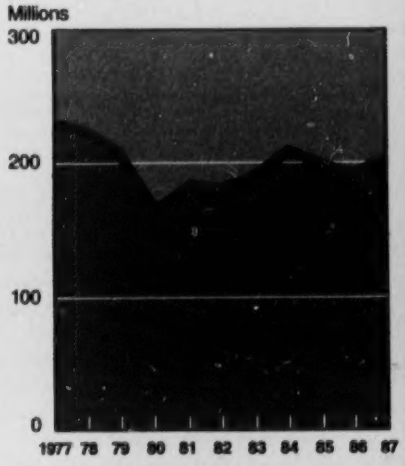
Source: Bureau of the Census

Motor vehicles



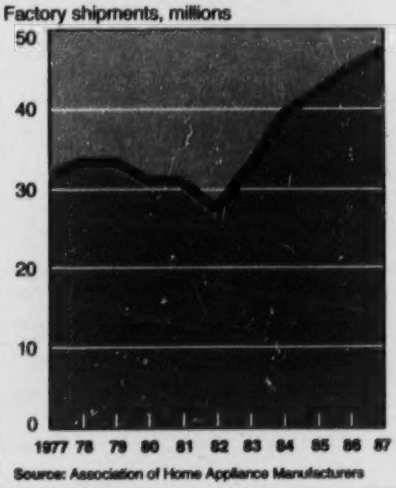
Source: Motor Vehicle Manufacturers Association

Tires and tubes



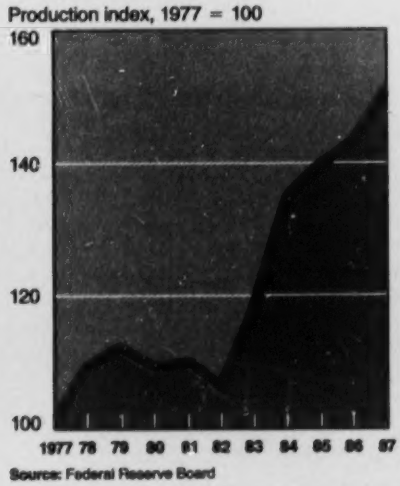
Source: Rubber Manufacturers Association

Major home electrical appliances



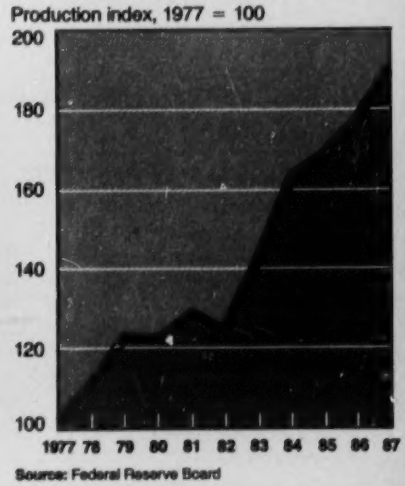
Source: Association of Home Appliance Manufacturers

Furniture and fixtures



Source: Federal Reserve Board

Miscellaneous plastics products

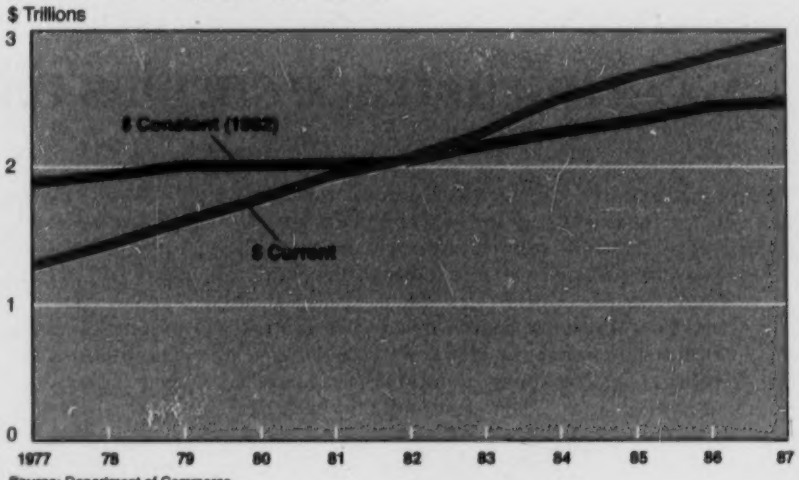


Source: Federal Reserve Board

ing—and the bulk of the industry's products eventually wind up in products bought by consumers.

Some of the industry's most important outlets, nonetheless, have recently been under strain—notably new housing, pinched by rising land and construction costs and higher mortgage rates, and new cars, which continue to be buffeted by rising sales of imported vehicles. On the other hand, demand has been strong for apparel and home furnishings. Business also has been good for paper producers and furniture manufacturers—and especially so for makers of miscellaneous plastics products, which consume about half of all U.S. output of plastics.

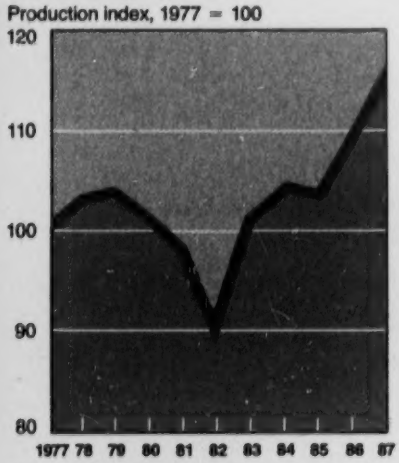
Personal consumption expenditures



Source: Department of Commerce

Textile mill products

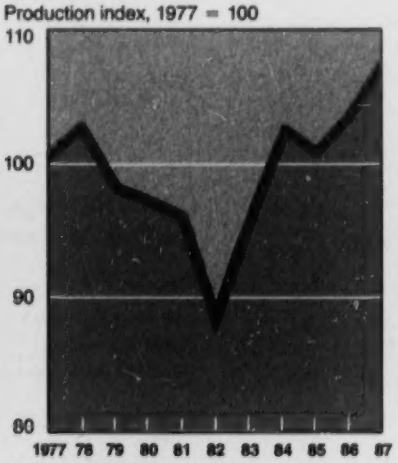
Production index, 1977 = 100



Source: Federal Reserve Board

Apparel

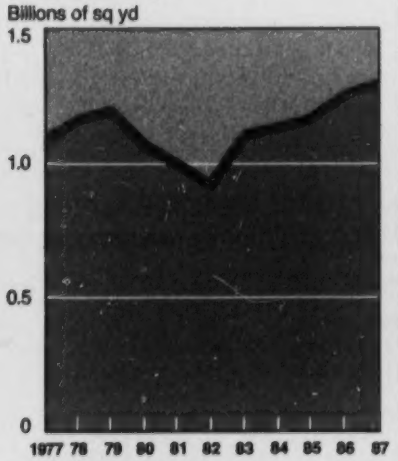
Production index, 1977 = 100



Source: Federal Reserve Board

Floor coverings

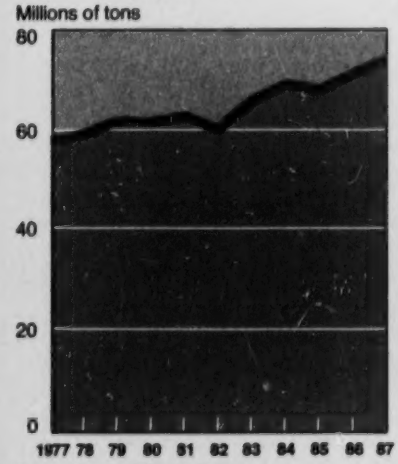
Billions of sq yd



Source: Bureau of the Census

Paper and paperboard

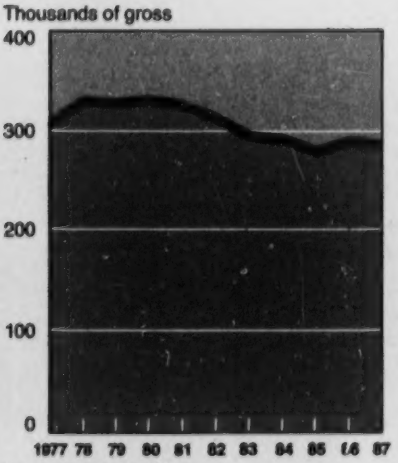
Millions of tons



Source: American Paper Institute

Glass containers

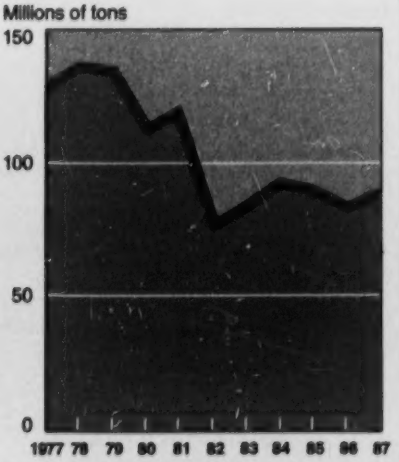
Thousands of gross



Source: Bureau of the Census

Steel

Millions of tons



Source: American Iron & Steel Institute

U.S. chemical trade surplus rebounds

U.S. chemical exports, riding the wings of a sharply weaker dollar, increased a hefty 16% last year, virtually twice the increase of chemical imports. As a result, the U.S. chemical industry was able to boost its heralded trade surplus from $7.8 billion in 1986 to $10.2 billion and now appears poised to match or surpass the record $12.1 billion surplus that it chalked up in 1980.

The achievement has been a long time coming. After its record year in 1980, the industry suffered through a five-year spell that saw its trade surplus plunge to a lowly $7.2 billion in 1985. During that time, chemical exports grew a mere 5%. Imports, meanwhile, had surged 69%.

Since 1985, however, the industry's trade fortunes have been improving. Last year, chemical exports advanced to a record $26.4 billion. Imports managed a healthy, but less impressive 8% gain to $16.2 billion—also a record.

Despite this impressive performance, the U.S. chemical industry's share of world chemical exports is declining. It dropped from 14.0% in 1986 to 13.2% last year. In 1984, it had been a lofty 16.8%.

How can this be, when the industry's trade performance has been so strong during the past two years? The answer lies in the dramatic changes in currency exchange rates.

As currencies of major foreign countries have become stronger against the U.S. dollar, the value of their respective chemical exports has become inflated if they are expressed in dollars. For instance, chemical exports of the European Community rose 22% last year, measured in dollars. However, if European Currency Units are the yardstick, the community's chemical exports increased only 4%. That is why, on a dollar basis, total world exports of chemicals were up an unlikely 21% last year to $216 billion.

U.S. TOTAL TRADE BALANCE: Deficit practically unchanged last year

$ Billions	1987	1986	1985	1977
Total exports	$252.9	$217.3	$213.1	$121.2
Total imports	405.9	370.0	345.3	147.7
Trade balance	−153.0	−152.7	−132.2	−26.5

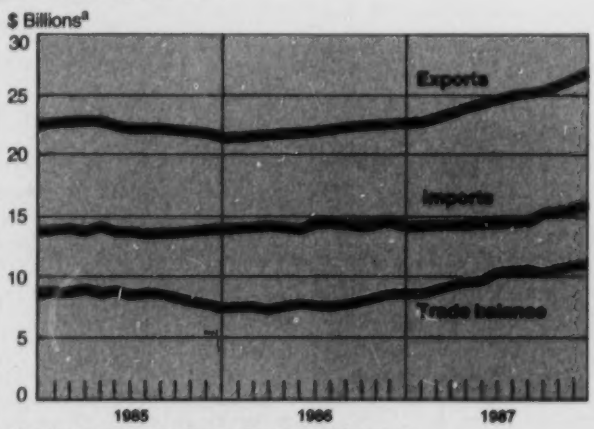
Source: Department of Commerce

U.S. CHEMICAL TRADE BALANCE: Surplus widened appreciably

$ Millions	1987	1986	1985	1977
Chemical exports	$26,381	$22,766	$21,759	$10,827
Chemical imports	16,213	15,001	14,533	5,432
Chemical trade balance	10,168	7,765	7,226	5,395

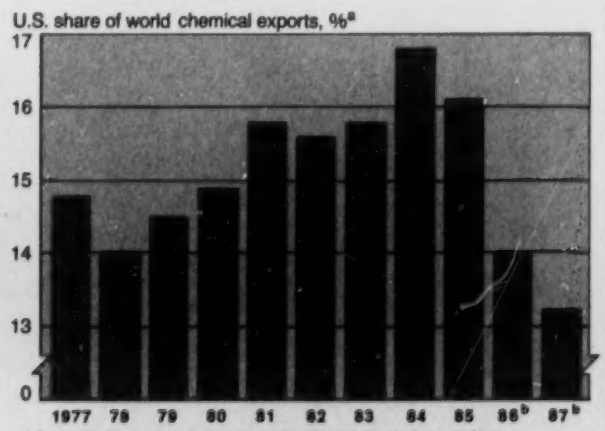
Source: Department of Commerce

Export surge bolstered U.S. chemical trade surplus . . .



a Running 12-month totals. Source: Department of Commerce

. . . but slumping exchange rates depressed U.S. market share



a U.S. chemical exports as a percentage of total world chemical exports less U.S. chemical imports. b C&EN estimate. Source: Department of Commerce

U.S. TRADE: Higher in most world markets

$ Millions	1987	1986	1985	1977
U.S. CHEMICAL EXPORTS				
Canada	$ 3,324	$ 2,668	$ 2,698	$ 1,539
Western Europe	8,020	7,032	6,742	3,737
Eastern Europe	343	385	368	78
Communist Asia	739	441	513	20
Japan	3,430	3,081	2,908	977
Rest of Asia	4,115	3,377	3,024	955
Middle East	422	345	400	269
Latin America	4,406	4,025	3,681	2,350
Australasia	844	689	704	384
Africa	501	447	456	309
Other	237	276	265	209
TOTAL	$26,381	$22,766	$21,759	$10,827
U.S. CHEMICAL IMPORTS				
Canada	$ 3,048	$ 2,752	$ 2,913	$1,451
Western Europe	8,204	7,357	7,118	2,465
Eastern Europe	162	327	380	33
Communist Asia	195	179	163	22
Japan	2,172	1,792	1,412	465
Rest of Asia	697	623	457	89
Middle East	243	238	218	35
Latin America	957	942	1,216	212
Australasia	227	221	231	402
Africa	81	326	203	46
Other	227	244	222	212
TOTAL	$16,213	$15,001	$14,533	$5,432

Source: Department of Commerce

WORLD TRADE: Value in dollars up sharply

$ Millions	1987	1986	1985	1977
CHEMICAL EXPORTS				
World	$215,700[a]	$178,000[a]	$149,926	$78,225
U.S.	26,381	22,766	21,759	10,827
Canada	4,765	4,064	4,040	1,696
EC, 12 countries	119,898	97,961	80,513	44,278
Belgium-Luxembourg	9,691	8,597	6,882	4,620
France	19,862	16,763	13,715	7,162
Italy	9,087	7,060	6,608	3,156
Netherlands	16,824	13,786	11,324	6,321
U.K.	17,311	14,205	12,174	6,753
West Germany	38,105	31,202	24,253	14,216
Switzerland	9,660	8,124	5,879	3,580
Japan	11,662	9,484	7,697	4,300
CHEMICAL IMPORTS				
U.S.	$16,213	$15,001	$14,533	$ 5,432
Canada	5,340	4,758	4,454	2,347
EC, 12 countries	96,270	78,167	61,888	32,988
Belgium-Luxembourg	8,688	7,119	5,735	3,359
France	16,828	13,708	10,826	5,948
Italy	13,610	11,001	8,476	3,776
Netherlands	9,690	7,889	6,573	3,635
U.K.	13,500	10,772	8,896	4,303
West Germany	21,442	17,686	14,118	7,503
Switzerland	5,659	4,796	3,665	2,012
Japan	11,845	9,733	8,072	3,003

a C&EN estimates. Sources: United Nations, Organization for Economic Cooperation & Development, European Community, individual country data

U.S. TRADE, BY PRODUCTS: Strong gains for organic and inorganic chemicals and plastics

$ Millions	Chemical exports				Chemical imports			
	1987	1986	1985	1977	1987	1986	1985	1977
Organic chemicals	$ 7,550	$ 6,293	$ 6,012	$ 3,286	$ 5,408	$ 4,704	$ 4,576	$1437
Inorganic chemicals	2,112	1,771	1,967	1,047	2,030	1,894	1,984	1175
Radioactive materials	1,017	1,302	1,311	551	1,012	1,382	1,417	484
Dyeing, tanning, and coloring materials	217	174	139	126	621	487	352	142
Pigments, paints, and varnishes	411	333	322	227	427	348	266	44
Medicinals and pharmaceuticals	3,182	3,090	2,708	1,080	1,456	1,240	1,084	318
Flavors, perfumes, cosmetics, and toiletries	579	488	478	274	796	679	577	175
Cleaning and polishing materials	357	302	292	195	205	214	172	49
Fertilizer, manufactured	2,259	1,935	2,160	701	795	865	967	829
Explosives and pyrotechnics	91	81	100	78	110	111	103	36
Plastics and resins	5,492	4,301	3,777	1,732	1,987	1,837	1,631	389
Pesticides and disinfectants	732	664	614	a	398	580	399	a
Miscellaneous	2,382	2,032	1,878	1,530	968	660	1,005	354
TOTAL	$26,381	$22,766	$21,759	$10,827	$16,213	$15,001	$14,533	$5432

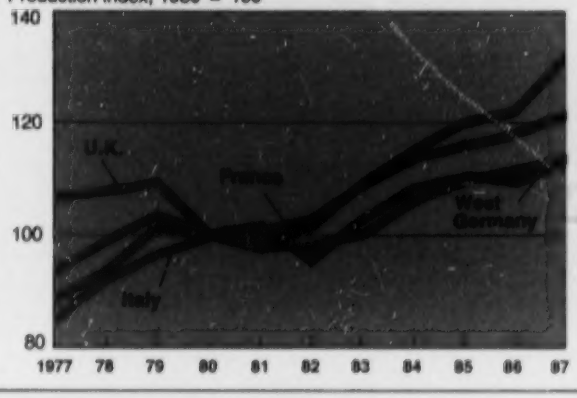
a Included in miscellaneous chemical products. Source: Department of Commerce

In 1987, West Germany's three largest chemical companies—BASF, Bayer, and Hoechst—were also the sales leaders in the West European chemical industry, although BASF nosed out Bayer for the top spot. They were followed by ICI of the U.K. and Montedison of Italy.

The weak U.S. dollar continued to affect financial results of the chemical industry. Corporate executives note that the translation of revenues from exports and foreign subsidiaries back into stronger home currencies depressed sales and, eventually, earnings. The dollar has fallen nearly 40% since 1985 against the currencies of some major European countries.

The fibers field in 1986 saw the dramatic increase in output from Turkey, which is pressing hard to join the European Community. Last year, fiber output in Turkey surpassed that in the U.K.

Chemical output has grown fastest in U.K.



CHEMICAL INDUSTRY TRENDS: Production and capital outlays higher, prices mixed

$ Billions (U.S.)	1987	1986	1985	1984	1983
WEST GERMANY					
Sales	$ 78.2	$ 64.5	$ 50.5	$ 49.5	$ 49.7
Exports	40.3	33.2	26.1	25.1	24.0
Imports	22.7	18.8	15.0	14.0	13.6
Capital spending	5.0	4.9	2.4	2.2	2.7
Production index[a]	112.7	110.1	111.1	108.8	103.4
Price index[a]	110.9	114.6	121.6	118.1	113.9
Employees (thousands)	572	567	557	550	549
FRANCE[b]					
Sales	$ 47.0	$ 39.5	$ 31.8	$ 30.9	$ 30.1
Exports	19.0	15.7	12.8	12.2	11.5
Imports	15.4	12.5	10.0	9.2	8.9
Capital spending	2.5	2.0	1.3	1.1	1.0
Production index[a]	121.1	117.5	116.3	114.3	108.7
Price index[a]	144.3	146.0	160.0	153.1	139.9
Employees (thousands)	264	269	272	279	282
ITALY					
Sales	$ 37.4	$ 30.7	$ 24.5	$ 23.6	$ 22.9
Exports	9.3	7.7	6.6	6.2	5.7
Imports	14.7	12.0	9.3	8.6	7.9
Capital spending	1.7	1.3	0.9	0.9	1.1
Production index[a]	114.3	111.8	110.3	106.2	100.0
Price index[a]	160.3	155.4	159.7	148.2	134.9
Employees (thousands)	225	230	233	241	251
U.K.[b]					
Sales	$ 37.3	$ 30.6	$ 26.3	$ 25.2	$ 25.6
Exports	17.1	14.1	12.1	11.0	10.5
Imports	13.6	10.7	9.0	8.8	8.1
Capital spending	2.3	1.9	1.6	1.4	1.4
Production index[a]	131.5	122.4	120.4	114.9	108.7
Price index[a]	138.5	133.4	131.6	125.1	119.1
Employees (thousands)	337	335	336	329	330
SPAIN[b,c]					
Sales	$ 25.5	$ 20.7	$ 16.1	$ 15.2	$ 14.2
Exports	4.2	3.1	2.9	2.7	2.2
Imports	6.3	4.7	3.1	3.0	2.8
Capital spending	0.4	0.4	0.3	0.2	0.3
Production index[a]	128.2	119.8	113.9	111.0	104.5
Price index[a]	180.4	177.7	175.9	163.6	147.4
Employees (thousands)	239	239	240	241	242

$ Billions (U.S.)	1987	1986	1985	1984	1983
BELGIUM[b,c,d]					
Sales	$ 19.7	$ 17.2	$ 14.1	$ 13.6	$ 13.2
Exports[d]	14.6	12.2	9.6	9.1	8.8
Imports[d]	10.6	9.2	6.9	6.6	6.3
Capital spending	0.9	0.7	0.4	0.4	0.4
Production index[a]	120.5	119.8	117.1	113.3	107.3
Price index[a]	136.4	141.6	145.0	139.9	133.7
Employees (thousands)	91	91	90	89	88
NETHERLANDS					
Sales	$ 19.5	$ 16.0	$ 13.9	$ 13.6	$ 13.1
Exports	19.0	15.7	12.9	12.5	12.0
Imports	11.5	9.5	8.0	7.2	6.8
Capital spending	1.6	1.1	0.8	0.8	0.7
Production index[a]	140.0	131.0	133.0	122.0	111.0
Price index[a]	105.0	105.0	123.0	116.0	115.0
Employees (thousands)	91	91	89	89	88
SWITZERLAND[b]					
Sales	$ 11.5	$ 9.3	$ 6.7	$ 6.5	$ 6.7
Exports	9.8	7.9	5.7	5.4	5.5
Imports	5.6	4.7	3.6	3.4	3.3
Production index[a]	129.5	125.5	122.9	115.7	109.6
Price index[a]	103.3	110.7	113.8	109.1	106.4
Employees (thousands)	69	68	66	65	68
SWEDEN					
Sales	$ 6.2	$ 5.0	$ 4.1	$ 4.1	$ 3.9
Exports	3.0	2.5	1.9	1.8	1.8
Imports	3.9	3.2	2.7	2.5	2.7
Capital spending	0.5	0.4	0.3	0.3	0.3
Production index[a]	121.2	111.5	114.0	114.6	113.2
Price index[a]	160.5	158.0	155.5	147.0	135.5
Employees (thousands)	45	43	43	44	43
NORWAY					
Sales	$ 2.9	$ 2.4	$ 2.0	$ 2.1	$ 2.1
Exports	1.6	1.3	1.2	1.2	1.1
Imports	1.6	1.4	1.1	1.0	0.9
Capital spending	0.2	0.2	0.1	0.1	0.1
Production index[a]	153.1	146.7	126.0	121.0	110.0
Price index[a]	134.0	127.0	127.0	126.1	123.6
Employees (thousands)	15	15	15	16	17

a 1980 = 100. b Excludes fibers. c Includes rubber and plastics processing. d Includes Luxembourg for exports and imports. Sources: National agencies and European Council of Chemical Manufacturers' Federations (CEFIC)

MAN-MADE FIBERS: Growth in output spotty for cellulosics, nil for noncellulosics

Millions of lb	1987		1986		1985		1984		1983		Change, 1986–87	
	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[a]	Cellulosics	Non-cellulosics[b]	Cellulosics	Non-cellulosics	Cellulosics
West Germany	1806	355	1738	354	1764	372	1674	359	1654	334	4%	0%
Italy	1441	64	1430	66	1409	67	1329	68	1166[a]	65	1	−3
Spain	591	78	608	80	633	80	599	73	539	70	−3	−2
Turkey	572	18	504	18	409	18	356	11	330	9	13	0
U.K.	501[c]	208[d]	525[c]	207[d]	557[c]	247[d]	561[c]	372[d]	541[c]	330[d]	−5	0
Benelux countries	399	109	379	108	365	95	318	94	189	90	5	1
France	382	50	392	45	427	44	456	61	437	83	−2	−11
Switzerland	210	0	216	0	226	0	218	0	204	0	−3	0
Ireland	172	0	162	0	140	0	136	0	118	0	6	0
Portugal	139	2	136	2	134	1	119	1	95	1	2	0
Austria	60	264	61	272	63	265	59	267	53	251	−2	−3
Finland	3	118	3	121	3	134	3	143	0	128	0	−2

a Includes polypropylene. b Excludes polypropylene. c Includes cellulose acetate filament. d Excludes cellulose acetate filament. **Source:** Comité International de la Rayonne et des Fibres Synthétiques

PRODUCTION: Higher for most chemicals, but the increases were generally modest

Millions of lb	1987	1986	1985	1984	Change 1986–87
FRANCE					
Sulfuric acid	8618	8826	9433	9898	−2%
Hydrochloric acid	1427	1381	1446	1686	3
Chlorine	2971	3151	3060	3103	−6
Sodium hydroxide	3123	3304	3196	3274	−5
Ammonia	4466	4455	4422	5170	0
Benzene	1439	1332	1399	1343	8
Toluene	72	83	89	87	−13
Xylenes	284	250	277	188	14
Ethylene	5319	4980	4749	4581	7
Propylene	3073	2283	2730	2652	35
Butadiene	677	641	634	667	6
Formaldehyde	180	176	203	210	2
Polyethylene	2523	2471	2266	2045	2
Polypropylene	1159	1034	933	871	12
Polystyrene	1166	1089	1074	1060	7
Polyvinyl chloride	2039	1960	1804	1737	4
Synthetic rubber	1184	1161	1199	1218	2
Phosphate fertilizer[a,b]	1209	1238	1340	1495	−2
ITALY					
Sulfuric acid	9598[e]	9170	9588	9370	5%
Nitric acid	2598[e]	2401	2599	2420	8
Phosphoric acid	848[e]	830	886	996	2
Chlorine	2288[e]	2106	2031	2095	9
Sodium hydroxide	2652[e]	2294	2268	2359	16
Sodium perborate	247[e]	214	218	229	15
Ammonia	3770[e]	4157	3250	3233	−9
Benzene	1313[e]	1106	1075	1179	19
Toluene	393[e]	512	766	688	−23
Xylenes	1080[e]	885	952	871	22
Formaldehyde	240[e]	297	301	325	−19
Acetic acid	140[e]	116	129	140	21
Carbon black	417[e]	418	403	380	0
Polyethylene	1674[e]	1504	1408	1602	11
Polystyrene	665[e]	785	707	695	−15
Polyvinyl chloride	1346[e]	1408	1358	1493	−4
Nitrogen fertilizers[c]	6890[e]	7052	7217	7134	−2

Millions of lb	1987	1986	1985	1984	Change 1986–87
U.K.					
Sulfuric acid	4796	5125	5621	5829	−6%
Hydrochloric acid[d]	384	346	337	345	11
Phosphoric acid	na	648	826	896	—
Chlorine	2256	2143	2269	2156	5
Benzene	2005	1876	1863	1660	7
Ethylene	3955	3828	3182	2913	3
Propylene	1929	1901	2141	2147	1
Butadiene	509	424	655	570	20
Formaldehyde	250	227	272	228	10
Acetone	259	271	323	355	−4
Polyethylene	882	940	1144	893	−6
Polypropylene	613	652	592	568	−6
Polyvinyl chloride	387	400	391	379	−3
Synthetic rubber	565	636	593	636	−11
WEST GERMANY					
Sulfuric acid	7260	7344	7571	8002	−1%
Hydrochloric acid	2179	2048	2079	2104	6
Nitric acid	5818	6210	6361	6284	−6
Chlorine	7595	7538	7686	7536	1
Sodium hydroxide	7523	7485	7581	7408	1
Sodium carbonate	3195	3173	3096	3000	1
Sodium sulfate	361	359	306	281	1
Carbon black	796	844	852	841	−6
Ammonia	5098	4146	5036	5183	23
Benzene	3316[e]	3373[e]	2723[f]	2734[f]	−2
Toluene	884	1052	860	816	−16
Xylenes	1102	1190	1089	1003	−7
Aniline	309	408	369	373	−24
Ethylene	6118	5868	6661	7093	4
Propylene	3467	3093	3665	3969	12
Butadiene	1543	1505	1851	1661	3
Ethylene oxide	1223	1093	1073	1044	12
Ethylene glycol	na	500	504	509	—
Propylene oxide	1181	1174	1179	1083	1
Propylene glycol	379	395	371	372	−6
***n*-Butanol**	689	689	604	589	0
Acetaldehyde	727	686	726	737	6
Acetic acid	704	653	655	668	8
Ethanol	240	217	170	120	11
Formaldehyde	1341	1265	1253	1283	6
Methanol	na	1016	1302	1504	—
Phthalic anhydride	522	433	378	453	21
Polyethylene	2980	2785	2725	2882	7
Polyvinyl chloride	2904	2732	2658	2490	6
Synthetic rubber	1035	1026	1007	988	1
Nitrogen fertilizers[c]	1674[g]	1634[g]	1826[h]	1843[h]	2
Phosphate fertilizers[b]	na	311	394	473	—

e C&EN Estimates. b As P_2O_5. c As N. d Manufacturers' sales. e From petroleum refining and coal processing. f From petroleum refining only. g Excludes calcium cyanamid fertilizers. h Includes calcium cyanamide fertilizers. na = not available. **Sources:** Government agencies for each country

COMPANY RESULTS: Profitability continued to improve for most European chemical producers

$ Millions	Net sales	Net income	Profit margin	Capital spending	R&D spending	Employees (thousands)
BASF (West Germany)						
1987	$22,354.4	$ 583.9	2.6%	$1532.2	$ 896.1	133.8
1986	18,650.2	419.4	2.2	1224.4	704.1	131.5
1985	15,094.2	339.5	2.2	950.3	488.1	130.2
1984	14,175.4	314.0	2.2	719.6	435.8	115.8
Bayer (West Germany)						
1987[a]	$20,635.0	$ 857.8	4.2%	$1425.0	$1276.7	164.4
1986[a]	17,642.4	624.0	3.5	1109.7	994.9	164.1
1985	15,621.1	488.4	3.1	700.0	725.9	176.1
1984	15,098.9	411.9	2.7	646.3	686.3	174.8
Hoechst (West Germany)						
1987[a]	$20,531.1	$ 848.9	4.1%	$1330.0	$1231.7	167.8
1986[a]	15,313.8	606.9	4.0	949.8	918.0	153.7
1985	14,531.3	499.3	3.4	804.4	708.5	180.6
1984	14,546.3	474.4	3.3	724.9	637.9	177.9
ICI (U.K.)						
1987	$18,234.4	$1245.9	6.8%	$1160.7	$ 755.7	127.8
1986	14,862.2	879.8[b]	5.9	942.8	573.3	121.8
1985	13,892.5	715.0[c]	5.1	821.2	452.1	118.6
1984	13,247.3	608.8[d]	6.1	589.6	399.7	115.6
Montedison (Italy)						
1987	$10,641.2	$ 436.7	4.1%	$ 786.3	$ 290.9	66.8
1986	8,607.6	(46.1)[e,f]	—	570.8	207.9	66.6
1985	7,402.8	126.3[g]	1.7	342.6	157.2	69.7
1984	7,047.2	(14.8)[e,h]	—	279.5	142.3	71.2
Ciba-Geigy (Switzerland)						
1987	$10,579.9	$ 738.3	7.0%	$ 918.1	$1122.8	86.1
1986	8,863.9	645.0	7.3	684.4	903.9	82.2
1985	7,406.9	598.4	8.1	493.1	680.5	81.0
1984	7,435.7	505.1	6.8	428.5	619.6	81.4
Rhône-Poulenc (France)						
1987	$ 9,344.4	$ 392.7	4.2%	$ 830.4	$ 585.2	83.0
1986	7,603.8	289.8	3.8	732.5	426.3	78.0
1985	6,240.5	257.1	4.1	460.5	317.6	78.0
1984	5,858.4	227.6	3.9	395.2	281.7	80.0
Norsk Hydro (Norway)						
1987	$ 8,086.5	$ 271.5	3.4%	$1451.0	$ 97.2	39.1
1986	7,085.3	(50.6)[e]	—	1562.7	81.2	43.1
1985	5,296.0	257.1	4.9	825.0	58.1	26.4
1984	4,910.4	295.6	6.0	651.0	29.5	19.8
Akzo (Netherlands)						
1987	$ 7,652.7	$ 354.8[i]	4.6%	$ 539.4	$ 399.5	67.4
1986	6,373.5	366.5[j]	5.7	451.4	304.5	68.4
1985	5,424.7	275.1[k]	5.1	303.6	218.4	65.0
1984	5,146.4	252.0[l]	4.9	244.2	198.8	66.1

$ Millions	Net sales	Net income	Profit margin	Capital spending	R&D spending	Employees (thousands)
Sandoz (Switzerland)						
1987	$ 6,026.2	$420.8	7.0%	$421.5	$540.3	44.0
1986	4,645.0	300.6	6.5	306.1	414.4	42.6
1985	3,436.2	215.0	6.3	169.9	294.7	40.2
1984	3,163.4	174.9	5.5	129.4	269.8	38.0
Solvay (Belgium)						
1987	$ 5,989.9	$325.9[m]	5.4%	$498.3	$247.1	45.0
1986	4,842.5	222.3[n]	4.6	517.1	192.6	44.8
1985	3,796.6	187.6[o]	4.9	271.1	131.8	44.5
1984	3,871.5	200.2[p]	5.2	195.6	126.7	43.5
Hoffmann-La Roche (Switzerland)						
1987	$ 5,171.1	$323.5	6.3%	$348.8	$715.8	47.5
1986	4,345.7	231.1	5.3	293.7	623.7	46.5
1985	3,634.3	183.6	5.1	220.2	486.3	45.5
1984	3,519.1	161.8	4.6	214.0	486.2	46.2
DSM (Netherlands)						
1987	$ 4,222.7	$260.6[q]	5.9%	$431.0	$140.4	27.9
1986	3,670.6	198.0[r]	5.4	329.0	91.8	27.3
1985[s]	7,267.8	146.1	2.0	297.6	57.2	26.6
1984[s]	7,018.8	179.6[t]	2.6	285.7	54.5	27.2
BOC International (U.K.)						
1987	$ 3,211.6	$273.4[u]	8.5%	$362.5	$ 61.5	37.5
1986	2,651.3	10.7[v]	0.4	347.4	55.7	37.7
1985	2,462.3	179.1[w]	7.3	312.8	46.2	36.9
1984	2,811.5	153.1[x]	5.4	322.6	56.6	38.7
Fisons (U.K.)						
1987	$ 1,246.4	$139.7[y]	11.2%	$ 6.1	na	10.4
1986	1,030.2	97.7[z]	9.5	10.4	na	10.2
1985	837.7	73.3[aa]	8.8	7.4	$ 22.7	9.0
1984	738.8	50.8[bb]	6.9	9.4	20.1	8.6
Albright & Wilson (U.K.)						
1987	$ 1,065.9	$ 44.8	4.2%	$ 55.6	na	6.4
1986	955.6	33.1	3.5	47.8	na	6.6
1985	832.1	27.8[cc]	3.3	55.7	na	6.8
1984	761.2	29.3[dd]	3.8	46.8	na	6.3
UCB (Belgium)						
1987	$ 874.9	$ 39.3[ee]	4.5%	$ 72.1	$ 36.2	7.4
1986	659.4	31.5[ff]	4.8	40.2	28.7	6.5
1985	524.3	17.0[gg]	3.2	22.9	19.5	6.4
1984	534.8	23.0[hh]	4.3	21.6	18.4	6.5
Laporte Industries (U.K.)						
1987	$ 758.4	$ 80.5[ii]	9.8%	$ 27.9	na	4.2
1986	618.2	60.4[jj]	9.8	33.0	na	4.1
1985	481.0	46.2[kk]	9.6	35.0	na	3.6
1984	475.4	37.3	7.8	13.5	na	3.6

a Excludes companies owned 50% or less. b Excludes nonrecurring loss of $63.0 million. c Excludes nonrecurring loss of $51.8 million. d Excludes nonrecurring loss of $26.7 million. e Net loss. f Excludes nonrecurring gain of $17.5 million. g Excludes nonrecurring minority interests' loss of $68.1 million. h Excludes nonrecurring gain of $17.6 million and minority interests' loss of $50.1 million. i Excludes nonrecurring gain of $134.6 million. j Excludes nonrecurring gain of $9.5 million. k Excludes nonrecurring gain of $0.8 million and minority interests' loss of $22.0 million. l Excludes nonrecurring loss of $10.6 million and minority interests' loss of $6.7 million. m Excludes nonrecurring loss of $90.0 million. n Excludes nonrecurring loss of $83.3 million. o Excludes nonrecurring loss of $50.5 million. p Excludes nonrecurring loss of $60.9 million. q Excludes nonrecurring loss of $40.4 million. r Excludes nonrecurring loss of $22.4 million. s Includes wholly owned DSM-Aardgas for 1984 and 1985. t Excludes nonrecurring gain of $6.3 million and minority interests' loss of $29.1 million. u Excludes nonrecurring loss of $6.2 million. v Excludes nonrecurring loss of $5.0 million and pretax write-off of $187.7 million. w Excludes nonrecurring loss of $4.9 million. x Excludes nonrecurring loss of $23.7 million. y Excludes nonrecurring loss of $6.4 million. z Excludes nonrecurring loss of $7.2 million. aa Excludes nonrecurring loss of $3.7 million. bb Excludes nonrecurring loss of $5.6 million. cc Excludes nonrecurring loss of $10.0 million. dd Excludes nonrecurring loss of $3.5 million. ee Excludes nonrecurring loss of $3.2 million. ff Excludes nonrecurring loss of $2.3 million. gg Excludes nonrecurring loss of $6.2 million. hh Excludes nonrecurring loss of $0.5 million. ii Excludes nonrecurring loss of $1.6 million. jj Excludes nonrecurring gain of $7.8 million. kk Excludes nonrecurring gain of $4.1 million. na = not available.

NOTE ON CURRENCY CONVERSION

For monetary statistics in this section, European currencies were converted to U.S. dollars by the following conversion rates:

	$1.00 (U.S.) is equivalent to:									
	Belgium	France	Italy	Netherlands	Norway	Spain	Sweden	Switzerland	U.K.	West Germany
1987	37.33 francs	6.01 francs	1296 lire	2.03 guilders	6.74 crowns	123.48 pesetas	6.34 crowns	1.49 francs	0.610 pound	1.80 marks
1986	44.67 francs	6.93 francs	1491 lire	2.45 guilders	7.39 crowns	140.05 pesetas	7.14 crowns	1.80 francs	0.682 pound	2.17 marks
1985	59.38 francs	8.99 francs	1909 lire	3.32 guilders	8.60 crowns	170.04 pesetas	8.60 crowns	2.46 francs	0.772 pound	2.94 marks
1984	57.78 francs	8.74 francs	1757 lire	3.21 guilders	8.16 crowns	160.76 pesetas	8.27 crowns	2.35 francs	0.748 pound	2.85 marks
1983	51.13 francs	7.62 francs	1519 lire	2.85 guilders	7.30 crowns	143.43 pesetas	7.67 crowns	2.10 francs	0.659 pound	2.55 marks

Source: International Monetary Fund

Japanese chemical companies didn't let a much stronger yen stop them from scoring higher profits last year. The sharply appreciating yen had the expected impact on trade figures; the percentage growth last year of both chemical exports and imports was much higher measured in U.S. dollars than in yen.

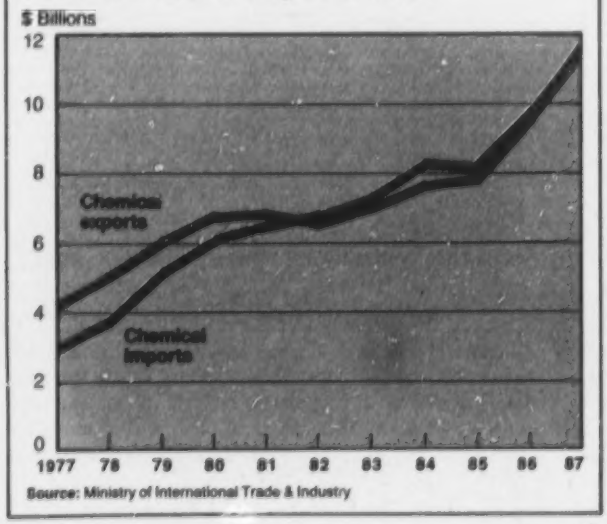
But other fears about the impact of the yen proved ill-founded. The Japanese economy started accelerating in the second half of 1987, with domestic demand more than picking up the slack from lower overall exports. In yen, total Japanese exports have declined for two successive years. But for Japanese chemical companies, strong domestic demand stimulated production last year, leading to higher sales and sharply improved profitability.

INDUSTRY TRENDS: Chemical output higher

Production index, 1980 = 100	1987	1986	1985	1984	Change 1986–87
All manufacturing	126.6	121.7	122.1	116.7	4%
All chemicals	131.3	122.2	121.8	117.9	7
Inorganic chemicals and pigments	114.3	110.0	110.3	105.9	4
Alkalies and chlorine	99.3	94.4	95.9	95.2	5
Organic chemicals	100.9	95.0	95.6	96.9	6
Petrochemicals	123.1	114.8	114.1	113.7	7
Aromatics	119.5	111.9	112.0	106.6	7
Cyclic intermediates and dyes	129.4	118.3	117.0	116.9	9
Plastics	129.2	120.9	119.9	119.7	7
Synthetic fibers	95.3	96.6	100.6	100.2	−1
Synthetic rubber	108.9	105.4	105.8	106.1	3
Fertilizer	69.5	71.5	76.8	79.8	−3
Textile materials	126.7	117.7	115.0	108.0	8
Medicinals and drugs	158.2	143.8	143.0	135.0	10

Source: Ministry of International Trade & Industry

Chemical trade nearly in balance



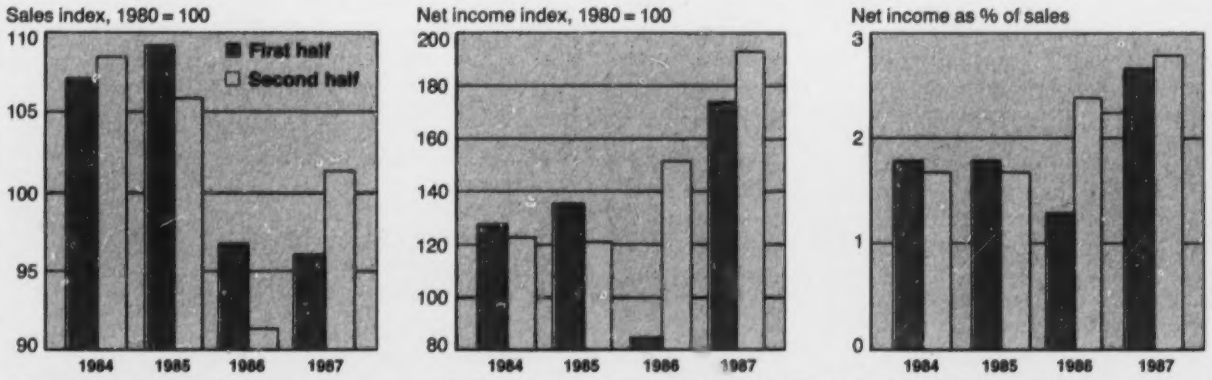
Source: Ministry of International Trade & Industry

PRODUCTION: Solid gains among organics

Thousands of metric tons unless otherwise indicated	1987	1986	1985	1984	Change 1986–87
INORGANIC CHEMICALS					
Ammonia	1784	1794	1981	2029	−1%
Ammonium chloride	332	364	373	387	−9
Ammonium sulfate	1804	1784	1837	1829	1
Calcium carbide	354	399	441	476	−11
Calcium superphosphate	499	514	529	559	−3
Carbon black	629	616	632	606	2
Chlorine, liquid	911	881	926	897	3
Hydrochloric acid	543	549	549	521	−1
Nitrogen, millions of cu m	6452	6293	6220	5896	3
Oxygen, millions of cu m	6878	6786	7388	7216	1
Sodium carbonate	1098	1022	1057	1036	7
Sodium hydroxide	3227	3077	3075	3085	5
Sodium silicate	664	603	594	596	10
Sulfuric acid	6541	6561	6580	6458	0
Titanium dioxide	238	223	217	205	7
ORGANIC CHEMICALS					
Acetaldehyde	285	254	271	297	12
Acetic acid	367	300	344	350	22
Acetone	260	228	237	246	14
Acrylonitrile	573	546	541	523	5
Benzene[a]	2224	2071	2084	2013	7
Butadiene	707	656	639	627	8
Butanol	259	248	258	243	4
Caprolactam	470	448	455	436	5
Cyclohexane	557	515	524	492	8
Dioctyl phthalate	261	257	241	249	2
Ethylene	4585	4291	4224	4390	7
Ethylene dichloride	2051	1908	1901	1939	7
Ethylene glycol	313	339	440	429	−8
Ethylene oxide	484	489	554	533	−1
Methanol	181	221	254	280	−18
Octanol	257	235	230	246	9
Phenol	308	260	262	272	18
Phthalic anhydride[a]	172	163	162	156	6
Propylene	3370	3167	2980	2981	6
Propylene glycol	236	223	219	205	6
Styrene	1559	1417	1418	1423	10
Terephthalic acid	1047	935	854	742	12
Toluene	882	805	803	784	9
Toluene diisocyanate	91	86	84	76	6
Urea	1767	1570	929	1120	13
Xylene	729	778	1523	1401	−6
PLASTICS					
Phenolic resins	332	313	325	334	6
Polyethylene	2182	2066	2027	2251	6
Polypropylene	1406	1333	1304	1271	5
Polystyrene	1735	1598	1599	1503	9
Polyvinyl chloride	1663	1540	1550	1504	8
SYNTHETIC RUBBER	1192	1150	1158	1160	4

a Petroleum-based product only. Source: Ministry of International Trade & Industry

Chemical sales recovered a bit, but profits soared, sharply improving profit margins



Note: Based on results of 12 leading Japanese chemical companies: Asahi Chemical Industry, Dainippon Ink & Chemicals, Hitachi Chemical, Mitsubishi Kasei, Mitsubishi Petrochemical, Mitsui Toatsu Chemicals, Sekisui Chemical, Showa Denko, Sumitomo Chemical, Takeda Chemical Industries, Teijin, and Toray Industries. The fiscal year for most, but not all, of these companies ends March 31. **Source:** Toyo Keizai Shinposha

COMPANY RESULTS: Profitability widened markedly for several chemical firms in the past year

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Asahi Chemical Industry[a]					
1987	$5357	$141.0	2.6%	$5241	15.6
1986	4351	84.6	1.9	4361	15.9
1985	3910	73.3	1.9	3661	15.9
1984	3129	57.3	1.8	3027	15.9
Mitsubishi Kasei[b]					
1987	$4360	$ 90.4	2.1%	$6002	8.9
1986	3775	42.0	1.1	5014	8.5
1985	3963	33.1	0.8	4016	8.2
1984	3271	7.0	0.2	3211	8.3
Toray Industries[a]					
1987	$3789	$113.5	3.0%	$4854	10.6
1986	3250	67.1	2.1	3947	11.7
1985	3177	78.2	2.5	3326	12.6
1984	2563	61.4	2.4	2663	13.2
Takeda Chemical Industries[a]					
1987	$3777	$219.6	5.8%	$4628	10.8
1986	2951	133.6	4.5	3599	10.8
1985	2331	98.4	4.2	2612	11.0
1984	1939	75.5	3.9	2246	11.1
Sumitomo Chemical[c]					
1987	$3609	$ 78.6	2.2%	$4615	7.7
1986	3085	29.3	1.0	3949	7.6
1985	3219	38.9	1.2	3277	7.1
1984	2876	58.4	2.0	2818	6.9
Sekisui Chemical[a]					
1987	$3089	$ 84.6	2.7%	$2555	5.3
1986	2229	31.0	1.4	1782	6.3
1985	1769	22.5	1.3	1439	6.2
1984	1415	16.9	1.2	1184	6.1

$ Millions	Sales	Net income	Profit margin	Total assets	Employees (thousands)
Dainippon Ink & Chemicals[a]					
1987	$2923	$ 43.7	1.5%	$3366	6.6
1986	2336	32.8	1.4	2214	6.3
1985	2102	26.4	1.3	1722	6.2
1984	1642	20.1	1.2	1449	6.0
Showa Denko[c]					
1987	$2908	$ 38.8	1.3%	$3881	5.0
1986	2116	22.1	1.0	3163	4.8
1985	2066	20.1	1.0	2738	4.6
1984	1683	0.5	0.0	2069	4.6
Mitsui Toatsu Chemical[a]					
1987	$2543	$ 43.5	1.7%	$3004	5.6
1986	2110	23.0	1.1	2599	5.6
1985	2102	14.7	0.7	2242	5.4
1984	1672	8.6	0.5	1810	5.3
Teijin[a]					
1987	$2167	$109.3	5.0%	$3391	6.2
1986	2039	72.0	3.5	2600	6.4
1985	2102	70.9	3.4	2210	7.0
1984	1766	57.3	3.2	1842	7.2
Mitsubishi Petrochemical[c]					
1987	$2022	$ 64.7	3.2%	$2843	2.8
1986	1642	25.7	1.6	2073	2.5
1985	2139	22.4	1.1	1939	2.4
1984	1592	43.3	2.7	1553	2.3
Hitachi Chemical[a]					
1987	$1748	$ 20.7	1.2%	$1056	4.9
1986	1387	14.1	1.0	891	5.0
1985	1123	9.3	0.8	720	4.9
1984	918	13.8	1.5	571	4.8

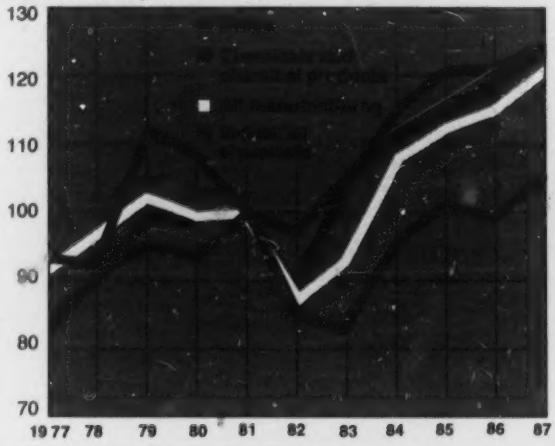
Note: Monetary statistics are converted from yen to U.S. dollars on the basis of $1.00 equals: 1987, 142.9 Y; 1986, 166.9 Y; 1985, 204.6 Y; 1984, 244.6 Y. Year-to-year changes in sales, net income, and assets are affected by these fluctuations in the currency exchange rate. a Fiscal year ends March 31. b Fiscal year ends Jan. 31. c Fiscal year ends Dec. 31. **Source:** Toyo Keizai Shinposha

The Canadian chemical industry can find little if anything to complain about in its performance last year. For most Canadian chemical companies, 1987 was a very good year. Strong demand for many products, together with higher selling prices, boosted earnings far above early estimates and widened profit margins markedly. For some companies, sales and earnings set new records.

As usual, ethylene derivatives, especially plastics, spearheaded the advance—in production, in sales, and in chemical exports. And some other chemicals that had been in the marketing doldrums in 1986 bounced back last year. Methanol is one example. Even the long-depressed fertilizer industry showed some signs of improvement in 1987.

Note on currency conversion: Monetary statistics in this section have been converted from Canadian dollars to U.S. dollars on the basis of $1.00 U.S. equals: 1987, $1.322 Canadian; 1986, $1.391 Canadian; 1985, $1.362 Canadian; 1984, $1.308 Canadian; 1983, $1.244 Canadian; 1982, $1.229 Canadian.

Chemical production higher in Canada



a Gross domestic product. **Source:** Statistics Canada

COMPANY RESULTS: Profits soared in 1987

$ Millions (U.S.)	Sales	Net income[a]	Profit margin	Capital expenditures	Employees (thousands)
C-I-L Inc.					
1987	$1013.0	$ 30.2	3.0%	$37.8	5.8
1986	927.5	14.4	1.6	38.1	5.6
1985	927.8	28.6	3.1	86.6	6.3
1984	899.6	29.1	3.2	90.5	6.3
Celanese Canada					
1987	$ 265.5	$ 21.5	8.1%	$16.1	2.1
1986	248.2	13.5	5.5	9.0	2.1
1985	247.7	9.3	3.7	11.2	2.1
1984	263.2	4.7	1.8	9.4	2.8
Du Pont Canada					
1987	$1021.4	$ 68.5	6.7%	$47.9	4.2
1986	893.7	43.4	4.9	67.9	4.6
1985	870.7	15.1	1.7	52.4	4.9
1984	895.5	31.5	3.5	34.6	5.0
Polysar Energy & Chemical					
1987[b]	$1855.7	$106.8	5.8%	$53.4	na
1986[c]	1463.2	13.4	0.9	60.8	6.5
1985[c]	1371.1	0.1	—	42.8	6.7
1984[c]	1083.4	27.5	2.5	43.8	6.0
Union Carbide Canada					
1987	$ 318.4	$ 19.4	6.1%	$26.2	2.3
1986	258.1	14.5	5.6	29.7	3.3
1985	254.8	11.7	4.4	16.4	3.8
1984	300.3	9.0	3.0	15.0	4.1

a Excludes extraordinary gains and losses. b Petrochemical operations only. c Data for Polysar Ltd.

PRODUCTION: Growth for organics, plastics

Thousands of metric tons	1987	1986	1985	1984	Change 1986–87
INORGANIC CHEMICALS					
Ammonia	3512	3540	3620	3493	−1%
Ammonium nitrate	844	948	1075	1035	−11
Ammonium phosphate	941	1149	1301	1383	−18
Carbon black	249	154	173	177	67
Chlorine	1635	1536	1424	1424	6
Hydrochloric acid	164	153	158	161	7
Nitric acid	900	1024	1128	1100	−12
Phosphoric acid, 100% P_2O_5	464	554	629	691	−16
Sodium chlorate	432	373	336	313	16
Sodium hydroxide	1770	1696	1589	1574	4
Sulfuric acid	3437	3536	3890	4043	−3
Zinc oxide	44	38	na	31	15
ORGANIC CHEMICALS					
Acetone	na	na	23	25	—
Benzene	720	635	691	549	13
Butadiene	167	146	132	127	14
Butylene	156	142	133	129	10
Ethylene	2140	1909	1745	1464	12
Formaldehyde	122	117	na	97	4
Methanol	1627	1403	na	1872	16
Propylene	628	628	647	656	0
Toluene	596	393	472	395	1
Urea	2142	2330	2033	2162	−8
Xylenes	345	356	415	406	−3
PLASTICS					
Polyethylene, low density	1021	887	733	529	15
Polyethylene, high density	269	242	229	227	11
Polyethylene, total	1291	1129	962	755	14
Polystyrene[a]	197	186	178	171	6
Polyesters, unsaturated	47	37	36	34	27

a Includes acrylonitrile-butadiene-styrene resins. na = not available. **Source:** Statistics Canada

SHIPMENTS: Dollar volume climbed more than 10% in most product areas

$ Millions (U.S.)	1987	1986	1985	1984	1983	1982
All manufacturing	$197,811	$179,420	$179,177	$174,373	$163,192	$152,551
Chemicals and chemical products	14,526	13,066	12,898	12,821	12,613	11,573
Industrial chemicals, inorganic	1,818	1,651	1,605	1,757	1,750	1,702
Industrial chemicals, organic	3,321	2,725	2,833	2,966	3,102	2,947
Plastics and synthetic resins	1,621	1,396	1,317	1,331	1,302	1,126
Pharmaceuticals and medicinals	1,944	1,664	1,536	1,468	1,336	1,187
Adhesives	123	111	98	94	92	64
Paint and varnish	1,125	951	881	815	784	667
Soaps and cleansers	1,023	1,038	1,028	962	940	902
Toilet preparations	751	640	626	614	597	542
Printing ink	214	209	184	183	172	149
Miscellaneous	1,474	1,325	1,292	1,258	1,274	1,317
Synthetic fibers	691	586	563	568	607	485
Plastic products	3,394	2,890	2,700	2,633	2,448	2,183

Source: Statistics Canada

CHEMICAL IMPORTS: 12% higher in 1987

$ Millions (U.S.)	1987	1986	1985	1984
Inorganic chemicals	$ 397	$ 378	$ 374	$ 381
Organic chemicals	1270	1162	1107	1120
Fertilizers and fertilizer materials	157	143	152	158
Synthetic and reclaimed rubber	202	169	160	158
Plastic materials	831	702	651	644
Plastic film and sheet	373	306	278	253
Other plastic shapes and forms	262	233	214	202
Dyes, except dyeing intermediates	71	58	49	56
Pigments, lakes, and toners	114	94	78	77
Paints and related products	176	133	127	113
Other chemical products	859	820	807	824
TOTAL	**$4712**	**$4138**	**$3997**	**$3986**
Imports from U.S.	**$3586**	**$3145**	**$3034**	**$3114**
U.S. share	**76%**	**75%**	**76%**	**78%**

Source: Statistics Canada

CHEMICAL EXPORTS: U.S. share down

$ Millions (U.S.)	1987	1986	1985	1984
Chemical elements	$ 167	$ 173	$ 158	$ 174
Other inorganic chemicals	907	881	828	797
Organic chemicals	1027	882	995	992
Fertilizers and fertilizer materials	960	835	946	1171
Synthetic rubber and plastic materials	854	631	587	481
Plastics, basic shapes and forms	379	327	238	203
Other chemical products	336	291	236	236
TOTAL	**$4629**	**$3961**	**$3988**	**$4054**
Exports to U.S.	**$2938**	**$2625**	**$2669**	**$2663**
U.S. share	**63%**	**67%**	**67%**	**66%**

Source: Statistics Canada

TRADE BALANCE: Surplus increased slightly

$ Billions (U.S.)	1987	1986	1985	1984	1983
Total exports	$91.8	$83.8	$85.3	$83.8	$71.1
Total imports	88.0	81.3	77.1	73.2	60.8
Trade balance	3.8	2.5	8.2	10.6	10.3

Chemical trade deficit narrowed

$ Millions (U.S.)	1987	1986	1985	1984	1983
Chemical exports	$4629	$3961	$3988	$4054	$3487
Chemical imports	4712	4198	3997	3986	3531
Chemical trade balance	−83	−237	−9	68	−44

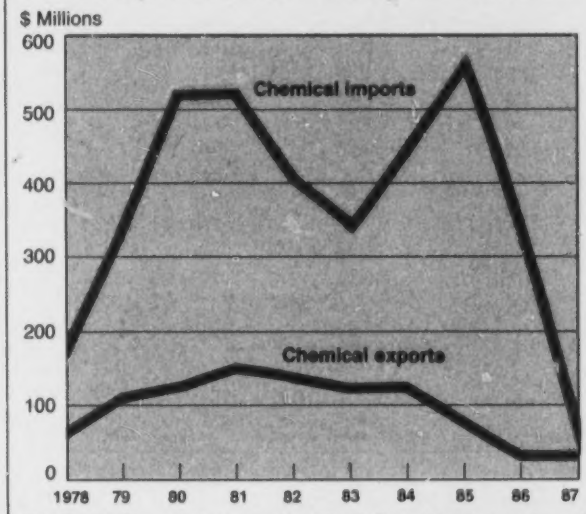
Source: Statistics Canada

PRICES: Increases largest for plastics, drugs

Price index, 1981 = 100	1987	1986	1985	Change 1986–87
All commodities	122.8	119.6	118.6	3%
Chemicals and chemical products	119.6	116.1	114.5	3
Inorganic industrial chemicals	111.6	113.5	114.5	−2
Sulfuric acid	130.6	125.2	121.7	4
Chlorine	130.4	128.5	130.1	1
Organic industrial chemicals	94.9	90.2	94.5	5
Benzene-toluene-xylene	70.1	68.5	94.0	2
Olefins	79.5	76.9	83.5	3
Synthetic resins	117.8	110.4	109.4	7
Polyethylene[a]	105.6	96.5	90.8	9
Polystyrene	122.7	93.9	93.6	31
Thermosets	116.2	108.3	115.1	7
Synthetic fibers	101.7	100.1	101.2	2
Pharmaceuticals	160.3	150.0	141.5	7
Paint and varnish	130.2	129.4	121.6	1
Soaps and cleansers	127.6	123.4	119.1	3
Toilet preparations	152.1	146.3	140.9	4
Agricultural chemicals	118.8	111.4	111.9	1
Pigments, lakes, and toners	120.7	119.6	115.0	1
Mixed fertilizers	97.9	97.2	100.4	1
Inks	110.7	111.4	110.4	−1

a Includes both high and low density. **Source:** Statistics Canada

Pemex's petrochemical trade has dwindled



Note: Trade by Pemex of primary petrochemicals only. Does not include secondary chemicals. 1987 import statistics reflect the fact that private companies, as well as Pemex, can now import primary petrochemicals directly. **Source:** Petróleos Mexicanos

DOMESTIC SALES: Slump continued

Thousands of metric tons[a]	1987	1986	1985	1984	Change 1986–87
Acetaldehyde	157	150	199	212	5%
Acrylonitrile	58	91	96	84	−36
Ammonia, anhydrous	1909	1857	1804	1670	3
Benzene	14	13	17	12	7
Butadiene	18	68	110	106	−73
Cyclohexane	51	55	62	50	−8
Dodecylbenzene	92	102	100	101	−10
Ethylene oxide	94	109	118	112	−14
Hexane	48	37	48	50	28
Isopropyl alcohol	16	42	61	58	−62
Methanol	160	176	176	162	−9
Polyethylene, high density	78	119	134	136	−34
Polyethylene, low density	296	282	266	222	5
Styrene	119	123	140	125	−3
Sulfur	497	462	457	455	8
Toluene	77	90	97	85	−15
Vinyl chloride	173	261	275	259	−34
o-Xylene	63	43	38	32	46
p-Xylene	203	226	268	263	−10

a Domestic sales by Petróleos Mexicanos (Pemex) of primary petrochemicals. **Source:** Pemex

CHEMICAL IMPORTS: Pemex has cut many

Thousands of metric tons[a]	1987	1986	1985	1984	Change 1986–87
Acetaldehyde	0	26	70	70	—
Acrylonitrile	0	36	50	34	—
Ammonia	151	13	39	0	1070%
Butadiene	0	44	97	67	—
Cyclohexane	0	19	33	26	—
Dichloroethane	0	0	0	57	—
Dodecylbenzene	0	5	39	49	—
Ethylbenzene	3	0	6	16	—
Ethylene oxide	0	2	48	11	—
Isopropyl alcohol	0	26	50	44	—
Perchloroethylene	0	15	14	15	—
Polyethylene, high density	1	82	42	19	−99
Polyethylene, low density	1	76	127	63	−99
Propylene	22	26	26	26	−16
Propylene tetramer	6	47	19	12	−87
Styrene	0	49	112	93	—
Toluene	0	47	43	37	—
Vinyl chloride	0	100	162	109	—
p-Xylene	0	7	9	0	—
p-Xylene	0	114	179	119	—

a Imports by Petróleos Mexicanos (Pemex) of primary petrochemicals. **Source:** Pemex

PRODUCTION: Some petrochemicals surge

Thousands of metric tons[a]	1987	1986	1985	1984	Change 1986–87
Acetaldehyde	158	136	145	147	16%
Acrylonitrile	58	54	49	49	8
Ammonia, anhydrous	2121	1949	2261	2156	9
Benzene	282	222	178	156	27
Butadiene	21	18	18	20	18
Cyclohexane	52	39	32	30	32
Cumene	38	42	39	33	−10
Dichloroethane	326	271	193	220	20
Dodecylbenzene	98	103	61	51	−5
Ethane	2518	2550	1905	1574	−1
Ethylbenzene	152	91	46	31	67
Ethylene	804	767	670	643	5
Ethylene oxide	95	114	71	97	−16
Hexane	98	101	98	95	−3
Hydrochloric acid	117	83	63	77	41
Isopropyl alcohol	17	11	14	14	52
Methanol	191	182	192	197	5
Nitrogen	49	49	46	47	0
Oxygen	179	206	211	200	−13
Polyethylene, high density	76	69	67	76	10
Polyethylene, low density	275	242	160	134	14
Propylene	257	232	207	208	11
Propylene tetramer	76	51	31	35	48
Styrene	121	69	33	30	74
Sulfur, recovered	501	456	475	461	10
Toluene	313	238	220	216	32
Vinyl chloride	179	141	108	132	27
m- and *p*-Xylene	313	231	247	225	35
o-Xylene	68	42	44	43	64

a Production by Petróleos Mexicanos (Pemex) of primary petrochemicals. **Source:** Pemex

PRODUCTION GROWTH: Slower in 1987 for most East European nations

% annual change in gross output	1987	1986	1985	1984	1983
U.S.S.R. and East Europe					
All industry	3.7%	4.8%	3.9%	4.3%	4.3%
Bulgaria					
All industry	3.3	4.0	3.2	4.2	4.3
Chemicals	1.3	4.9	3.6	8.2	5.9
Czechoslovakia					
All industry	2.3	3.2	3.5	4.0	2.8
Chemicals	na	4.0	5.1	4.5	3.3
East Germany					
All industry[a]	3.7	3.7	4.4	4.2	4.1
Chemicals	2.5	2.2	3.7	4.3	2.9
Hungary					
All industry	3.7	1.9	0.7	3.2	1.2
Chemicals[b]	6.2	1.3	0.8	4.4	1.6
Poland					
All industry	3.3%	4.7%	4.5%	5.2%	6.4%
Chemicals	5.2	4.2	3.0	5.0	8.2
Romania					
All industry	4.5	7.7	4.8	6.7	4.7
Chemicals	na	8.3	0.3	8.1	5.4
U.S.S.R.					
All industry[c]	3.8	4.9	3.9	4.1	4.2
Chemicals[c]	3.2	6.3	5.0	5.1	5.9
All industry[d]	na	3.6[e]	2.7	2.6	2.7
Chemicals[d]	na	4.4[e]	4.3	3.4	5.8

a Industrial commodity production. b For state and cooperative industry only. c Figures based on official Soviet statistics. d Figures based on Central Intelligence Agency estimates, giving lower results because of postulated upward bias in official figures. e Preliminary figure. na = not available. **Sources:** United Nations Economic Commission for Europe and state central statistical bureaus, Central Intelligence Agency

PRODUCTION: Increases were modest during mid-1980s for several big-volume chemicals

Thousands of metric tons, unless otherwise noted	1987[a]	1986	1985	1984	1983
U.S.S.R.					
Sulfuric acid	28,500	27,847	26,037	25,338	24,714
Mineral fertilizers[b]	36,300	34,739	33,194	30,808	29,733
Nitrogen[b]	15,900	15,221	14,223	13,328	13,014
Phosphate[b,c]	9,601	9,279	8,596	7,695	7,417
Potassium[b]	10,790	10,228	10,367	9,776	9,294
Synthetic ammonia[d]	na	19,590	18,232	17,677	16,904
Plastics[e]	5,500	5,345	5,019	4,819	4,419
Sodium hydroxide	3,300	3,229	3,056	2,972	2,853
Ethylene	na	2,799	2,667	2,543	2,267
Methanol	na	3,219	2,850	2,467	2,174
Synthetic rubber[f]	na	2,250	2,125	2,085	1,970
Pesticides[g]	327	332	346	343	332
BULGARIA					
Sulfuric acid	na	807	810	908	861
Mineral fertilizers[b]	na	580	640	690	687
Nitrogen[b]	na	448	469	479	483
Phosphate[b]	na	132	172	211	204
Synthetic ammonia[d]	na	1,091	1,138	1,138	1,124
Plastics	na	420	393	430	398
Sodium hydroxide	na	138	151	163	147
Synthetic rubber	na	26	26	26	25
Pesticides[g]	na	15	18	20	21
CZECHOSLOVAKIA					
Sulfuric acid	1,264	1,292	1,297	1,246	1,244
Mineral fertilizers[b]	na	1,041	1,204	1,190	1,175
Nitrogen[b]	596	614	582	576	591
Phosphate[b,c]	277	307	407	398	378
Potassium[b,g]	na	120	215	216	206
Synthetic ammonia[d]	na	930	994	827	809
Plastics	1,152	1,140	1,103	1,039	1,002
Sodium hydroxide	na	335	331	329	330
Synthetic rubber	na	76	70	71	67
Pesticides[g]	na	20	19	17	16
EAST GERMANY					
Sulfuric acid	na	883	883	885	926
Mineral fertilizers[b]	5,100	5,046	4,843	4,732	4,714
Nitrogen[b]	1,300	1,252	1,078	959	968
Phosphate[b,c]	300	309	299	308	315
Potassium[b]	3,500	3,485	3,465	3,465	3,431
Synthetic ammonia[d]	na	1197	1210	1207	1210
Plastics	na	1045	1048	1056	1045
Sodium hydroxide	na	638	667	694	687
Synthetic rubber	na	130	140	152	155
Pesticides[g]	na	62	60	58	54
HUNGARY					
Sulfuric acid	na	556	541	549	606
Mineral fertilizers[b]	1064	1040	1066	1100	1110
Nitrogen[b]	na	655	684	675	685
Phosphate[b]	na	267	252	286	285
Potassium[b,h]	na	118	130	139	140
Synthetic ammonia[d]	na	762	790	813	812
Plastics	na	423	389	385	345
Ethylene	270	269	271	265	261
Sodium hydroxide[i]	197	202	194	194	192
POLAND					
Sulfuric acid	3147	2966	2863	2769	2786
Mineral fertilizers[b]	na	2526	2270	2356	2324
Nitrogen[b]	1543	1445	1254	1369	1341
Phosphate[b]	943	948	889	869	872
Potassium[b,h]	na	133	127	118	111
Synthetic ammonia[d]	na	1747	1490	1499	1430
Plastics	639	632	603	601	535
Sodium hydroxide	425	427	414	379	392
Ethylene	na	279	261	256	198
Synthetic rubber	117	116	126	119	120
ROMANIA					
Sulfuric acid	na	1971	1835	1915	1941
Mineral fertilizers[b]	na	3278	3097	3073	2913
Nitrogen[b]	na	2315	2197	2212	2091
Phosphate[b]	na	849	788	765	733
Synthetic ammonia[d]	na	3037	2876	2857	2723
Plastics	na	664	628	655	633
Sodium hydroxide	na	846	814	805	745
Ethylene	na	312	307	317	316
Synthetic rubber	na	173	156	159	147
Pesticides[g]	na	53	53	53	48

a Approximate figures or estimates. b Nutrient content basis, as N, P_2O_5, or K_2O. c Including production of ground phosphate rock for direct applications and phosphate animal feeds. d Nitrogen content. e Including resins for man-made fibers. f Estimated. g On basis of active substance. h Imported potash added to domestically produced nitrogen and phosphate to form multinutrient fertilizer. i Including regenerated NaOH. na = not available. **Sources:** Central Intelligence Agency, Department of Agriculture, official national statistics from state central statistical bureaus

CHINA

PRODUCTION: Strong growth in 1987 for most chemical products

Thousands of metric tons, unless otherwise noted	1987	1986	1985	1984	Change 1986–87
Fertilizer[a]	17,033	14,258	13,222	14,602	20%
Synthetic ammonia	19,486	17,195	17,212	18,374	13
Sulfuric acid	9,620	7,510	6,764	8,172	28
Sodium hydroxide	2,735	2,458	2,347	2,222	11
Sodium carbonate	2,372	2,150	2,011	1,880	10
Plastics	1,571	1,283	1,208	1,180	22%

Thousands of metric tons, unless otherwise noted	1987	1986	1985	1984	Change 1986–87
Man-made fibers	1,157	1,016	945	735	14%
Synthetic detergents	1,190	1,150	1,005	810	3
Ethylene	839	642	651	648	31
Pesticides	260	223	211	299	17
Pharmaceuticals	154	107	58	54	44
Rubber tires[b]	24,478	19,932	18,527	15,690	23

a Nutrient content. b In thousands of units, not including wheelbarrow and bicycle tires. na = not available. Sources: State Statistical Bureau of the People's Republic of China, *China Daily*

CHEMICAL IMPORTS: Rebounded last year

$ Millions[a]	1987	1986	1985	Change 1986–87
Organic chemicals	$ 999	$ 781	$ 698	28%
Inorganic chemicals	423	330	321	28
Dyeing, tanning, coloring materials	203	158	141	28
Medicinal and pharmaceutical products	229	149	103	54
Fertilizers[b]	1403	678	1481	107
Plastic materials, resins, cellulose esters and ethers	1472	1216	1449	21
TOTAL	$5019	$3533	$4478	42%

Note: Monetary statistics are converted from Rmb to U.S. dollars on the basis of $1.00 equals: 1987, 3.72 Y; 1986, 3.72 Y; 1985, 3.2 Y. a Includes cost, insurance, and freight. b Manufactured. Source: General Administration of Customs of the People's Republic of China

CHEMICAL EXPORTS: Up sharply

$ Millions[a]	1987	1986	1985	Change 1986–87
Organic chemicals	$ 501	$ 386	$ 314	30%
Inorganic chemicals	554	357	291	55
Dyeing, tanning, coloring materials	176	117	78	50
Medicinal and pharmaceutical products	409	317	302	29
Essential oils, perfumes, cleansing materials	137	102	111	34
Explosives, pyrotechnic products	183	144	114	27
TOTAL	$2238	$1629	$1377	37%

a Free on board. Source: General Administration of Customs of the People's Republic of China

SOUTH KOREA

INDUSTRY TRENDS: Growth remained good

Index, 1980 = 100	1987	1986	1985	1984	Change 1986–87
Chemicals, petroleum, coal, rubber, and plastic products					
Production	179.6	164.7	146.6	140.7	9%
Shipments	164.5	152.5	138.1	132.6	8
Inventories	139.3	139.3	132.4	125.2	0
Industrial chemicals					
Production	163.8	142.6	129.4	126.4	15
Shipments	174.5	156.2	141.5	134.4	12
Inventories	138.7	128.6	137.0	117.3	8
Other chemical products					
Production	210.7	189.7	171.7	160.8	11
Shipments	211.4	186.8	168.6	158.7	13
Inventories	210.8	192.0	183.8	159.3	10
Rubber products					
Production	189.3	184.2	158.1	158.4	3
Shipments	196.1	184.1	158.4	158.2	7
Inventories	133.5	141.9	139.4	138.2	−6
Plastic products					
Production	213.4	173.2	153.6	145.3	23
Shipments	211.4	173.7	154.7	146.1	22
Inventories	162.9	159.5	130.6	139.9	2
All manufacturing					
Production	233.9	199.4	167.1	160.6	17
Shipments	221.3	188.9	160.6	153.6	17
Inventories	159.1	147.7	150.3	138.0	8

Source: Bureau of Statistics of the Korean Economic Planning Board

PRODUCTION: Mostly higher last year

Thousands of metric tons	1987[a]	1986	1985	1984	Change 1986–87
Sulfuric acid, 98%	2039	1898	2028	1975	7%
Complex fertilizers	1968	1863	1944	1861	6
Urea fertilizers	911	812	839	858	12
Ammonia	588	519	538	565	13
Ethylene	576	534	562	526	8
Polyvinyl chloride	451	473	411	344	−5
Polyethylene	469	385	353	317	22
Polyester fibers	373	320	291	265	16
Sodium carbonate	290	264	251	248	10
Sodium hydroxide	254	251	229	215	1
Benzene	351	301	216	171	17

a Preliminary. Source: Bureau of Statistics, Korean Economic Planning Board

FOREIGN TRADE: Chemical deficit widened

$ Millions	1987	1986	1985	1984
Exports[a]	$47,281	$34,714	$30,283	$29,245
Imports[b]	41,020	31,584	31,136	30,631
Trade balance	6,261	3,130	−853	−1,386
Chemical exports	1,321	1,068	936	845
Chemical imports	4,595	3,495	2,789	2,709
Chemical trade balance	−3,274	−2,427	−1,853	−1,864

a Free on board. b Includes cost, insurance, freight. Source: Korean Office of Customs Administration